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The Situation in Copper

While pessimism surrounds the copper market and the metal is being sold at concessions in price, the situation is really improving, because of increasing consumption and decreasing production, a condition that is reducing the accumulated surplus, although this is as yet taking place but slowly and the statistics for a single month may show an increase in the stock as was the case for February. At this writing the American statistics for March are not yet available; the European statistics have shown a decrease of about 5,000,000 lb. for that month. It is well known that domestic consumption is increasing steadily. We have received this week the report of Aron Hirsch & Sohn as to the world's production and consumption in 1909, which shows a substantial increase in the consumption of Germany and France in that year, Great Britain being the only important country that lagged behind. Its manufacturers ought to absorb a great deal of copper when conditions become right for a revival of demand from that quarter. In the meanwhile reports from France and Germany manifest a steady improvement in business there.

With respect to production the statistics of Aron Hirsch & Sohn show that the increase in 1909 occurred chiefly in America, which turned out 564,690 long tons (against 482,890 in 1908), while the corresponding figures for the rest of the world were 270,250 and 263,695. In November, 1909, American refinery production attained high water mark, since when it decreased a little in December and January but rose again in February. (We are considering the daily rate). In spite of the upturn in February, further decreases are to be expected, judging from reports of blister copper production, which is anticipatory of the refined by 60 to 90 days. Thus there was a decreased smeltery production in December, which ought to be reflected in the refinery statistics for March and April. The same smelters who produced 111,840,985 lb. in December furnished 108,359,893 lb. in January and only 90,153,019 lb. in February, the decrease in the average daily rate from January to February being about 275,000 lb. This indicates that the refinery statistics during the next quarter will show some falling off, although they will not correspond exactly with the smeltery figures.

The transferral of the accumulation from America to Europe that has been going on for a year has resulted in a rather curious state of affairs. Last May we had about 183,000,000 lb., while Europe had only 114,000,000. Now we have about 100,000,000 lb., which in itself would be nothing to be alarmed about, but Europe has 250,000,000 lb., and until that amount be reduced materially it would seem that we are not likely to export heavily unless our producers should see fit to make a concession in price.

The new production of copper that is coming to market need cause no immediate concern. It will be a year yet before Miami, Ray, Braden, Katanga and Copper River begin to produce much and even then their additions will come but gradually. Before that time many things may happen, and as we have seen lately the older mines do not last forever.

Production of Lead in 1909

Our revised statistics of lead production, based upon returns from all of the refiners, are given in the accompanying table. The difference between the revised figures and our preliminary report published Jan. 8, 1910, is only 180 tons as to the grand total, but as is apt to be the case, varies more materially in the distribution between desilverized of domestic and foreign origin, the refiners seldom being able to make an accurate classification at the very beginning of the year.

PRODUCTION OF REFINED LEAD IN 1909.

(In tons of 2000 lb.)

Class	1908.	1909.
1. Desilverized	174,650	211,499
2. Antimonial	13,109	126,784
3. Southeast Missouri	113,103	20,489
4. Southwest Missouri	18,014	10,392
Total domestic	318,876	369,164
5. Desilverized, foreign	94,992	89,681
6. Antimonial, foreign	(a)	2,338
Grand total	413,868	461,183

(a) Included with antimonial reported as of domestic origin.

The explanation is necessary that as in previous years the above statistics represent especially the production of the smelters and refiners whose business is mainly the treatment of ores and of lead derived directly from ores, but nearly all of them receive more or less scrap and junk which goes into their charges and reappears along with the virgin lead and for all practical purposes itself becomes virgin lead. There is also in the United States a large production of reworked lead by smelters who make that a special business, which is not included in the primary statistics.

The Coal Miners' Demands

After more than three weeks of conference, the coal operators and miners meeting in Cincinnati, failed to reach an agreement. The mines have been temporarily closed down and it now remains for the different States and districts to settle the wage question.

Although the miners' officials assert that there will be a stoppage of work until their demands are granted, it is unlikely that a long suspension will result save in some isolated instances. Both the miners and the operators realize that the present is an inopportune time for a strike. The last report of the United Mine Workers of America showed an amount in the treasury equal only to about $2 per man. As a consequence, those on strike will have to depend largely on their own funds.

The miners claim that present wages are insufficient to meet the higher cost of living. The operators assert that the industry at present is in a stagnant condition, and profits are insignificant. The coal business is so slack, and prices so poor, that many operators have welcomed a temporary shut-down. Many Ohio and Pennsylvania operators sold coal last year at a price which failed to net them any profit, a policy that was necessarily pursued in order to meet the competition of West Virginia and other non-union districts.

One reason why the operators took so decided a stand against a wage increase is because they made no reduction in the miners' wages two years ago when the business depression had caused the employers of labor in practically all other lines to cut wages. Reductions in the mining price occurred at this time in practically all unorganized fields producing competitive coal, and this condition of affairs made it difficult for Ohio and Pennsylvania to retain their markets. Notwithstanding their efforts, the outputs of Pennsylvania and Ohio recently have shown a much larger decrease than have those of West Virginia and Kentucky.

From every standpoint, and especially that of economy and safety, the miners' demands that coal be paid for on a run-of-mine basis, is to be severely condemned. For years coal has been paid for on a screened-coal basis, and this practice has been an incentive leading to the better preparation of the daily output. To go back to a mine-run basis would encourage shooting from the solid, with its resulting waste and dangers. If the miners could have obtained both the mine-run basis and an advance on the mine-run basis of 10c. per ton (their first demands), compared with present earnings this would mean an increase of 18 per cent.

Operators in unorganized fields are hoping for a long disagreement, which will give them an open market with good prices for a maximum output. West Virginia operators profited handsomely by the general strike in 1902, and they would welcome a repetition of such good fortune.

President Lewis was quoted as saying that he could organize and tie up West Virginia also, but such statements have been made before without being successfully carried out. It would appear that when all things are considered, the Ohio, Indiana and Pennsylvania miners are greatly aiding competitive fields in their work of securing the markets of the organized States. The evils of such a course will have to be borne by the miners as well as the operators of those States.

The present situation is not nearly so dark as it appeared in the early stages of the conference. It is likely that the operators will grant a wage increase equal to between 5 and 6c. per ton. Aside from the question of an increase in wages, the only two States which have vital problems to solve are Pennsylvania and Illinois. In Pennsylvania the question of the cost of permissible explosions is the point in dispute. The Illinois miners want the operators to assume the pay of the shot-firers, a thing which heretofore has been assumed by the miners. In the larger States, it is likely agreements will be reached in a week or two. In Missouri, Iowa and the Southwest, the suspension may last from 30 to 90 days.

The Granby Affair

After a meeting of the Granby directors, April 5, the following statement was officially made:

"In view of the unfavorable report that had been given out to the public as to the condition of the Granby mines, the directors at their meeting today decided to order another full investigation by well known experts for the purpose of reviewing the said report and ascertaining the exact condition of the mines. This examination, to be effective, will take several months, and may not be commenced until certain explorations now in progress shall have further advanced."

This statement will be a disappointment to the stockholders and to the public, who had been led to expect a publication of the full report now in the hands of the directors and a clearing up of the mystery. The only interpretation that can be placed upon the last statement is that a majority of the directors are not convinced as to the absence of prospective value in the mines, quite apart

from the measurable ore reserves (as to which there is probably not much question), and are minded to prosecute certain exploratory work before finally making a report.

This might have been a proper, although in some respects dangerous, course to pursue if the situation had been kept secret in the first place, but the leak having occurred and the blunt preliminary statement having been made, and the discrepancy among statements as to the ore reserves being of record and crying for an explanation, the directors have made a mistake in not laying all the facts immediately before their stockholders. Even if there be any lingering doubt as to the possibility of the mines disclosing new orebodies, the stockholders should have a chance to make up their own minds about that.

The directors of the company who live in New York and Boston are themselves the largest stockholders of the company. When the bad news about the mine became known to the president and his associates on the board, they emphasized the importance of keeping aloof from the stock market and did not attempt to dispose of any of their holdings. In this their course was strictly correct, praiseworthy, and we may also say, uncommon and exemplary. It is clear that the information as to condition of the mine came as a surprise to the Eastern management, that there was no unloading of Granby stock after the crisis and that the large stockholders are in the same fix with the small. Alike they were living in a fool's paradise. But how that happened needs to be explained, and the persons who are responsible—for responsibility there must be—ought to be exposed, and the directors have made a mistake in turning their back upon the policy of immediate frankness.

The Census Report on Mines and Mining

Once in 10 years, lately once in five years, the Federal Government in connection with its census has had an opportunity to make a statistical investigation of great value to the mining industry. In the past the results have been variable; some reports have been imperfect, but illuminating so far as they have gone; others have been worthless, not worth the paper they are printed on; none has risen to the great opportunity. It was hoped that in the forthcoming census, under the new director, who is an accomplished statistician and of a broad mind, something better than we have ever had previously might be expected. But it seems likely that we are once more doomed to disappointment.

The trouble now appears to be too much bureaucratic interference. The census officials, realizing the seriousness of some previous criticisms, took the trouble this year to consult experts respecting the preparation of the schedules of inquiry, which are the foundation of a competent statistical investigation. About this time the Geological Survey mixed into the business, and an alliance was made between it and the Census Bureau, one result of which has been that the advice obtained by the Census Bureau from outside experts did not receive full consideration.

Now, according to well authenticated reports, the arrangements between the Census Bureau and the Geological Survey are not working altogether satisfactorily. The two bureaus, by the terms of their agreement, some time ago sent out schedules to the mines and metallurgical works, and in due time despatched special agents to gather the schedules properly filled up. An inspection of the returns, so far received, has convinced some of those in charge that the results are wholly unreliable for the anthracite and bituminous coal regions, so much so that it is now understood that there is in contemplation a retaking of the anthracite census. As for the bituminous reports, although they are in an even worse shape, it is admitted that the task of retaking them would be too great and that nothing more can be done than to make the best possible use of the data already gathered.

The essential difficulty has been found in the fact that some of the questions asked in the schedules were incapable of intelligent answers, wherefore, the replies in many instances have been manifestly absurd. In some cases the cost of labor reported has exceeded the value of finished product and there have also been serious difficulties with the questions relating to constituents of manufacture, by-products and other matters.

It is now whispered privately that a mistake was made in not accepting the advice of the mining experts to whom the forms of the schedules were submitted in the first place. Strong efforts to correct the returns as shown by the schedules in some adequate manner are now under way. It is a great pity to have this shadow thrown over so elaborate a statistical investigation at so early a date.

We once called attention to the fact that New York is the greatest metallurgical center on earth. We have also remarked the considerable mining industry that has been carried on at several places within 75 miles of New York. This radius includes America's greatest zinc mine. Even the city itself has (on Staten Island) iron mines that were worked as late as 10 years ago. Is there any other great capital of the world that has had a mine within its municipal limits? The Staten Island ore was peculiar because of its content of about 1 per cent. of chromium, an element which also characterizes some of the Cuban ore.

The recent developments in Granby, North Butte and Calumet & Arizona, not to speak of some less important enterprises, teaches that the arithmetic of copper production still includes subtraction as well as addition. The statement of James J. Hill that the railways of America need to spend $9,600,000,000 in the next six years, to make their facilities meet the demands upon them, indicates that much metal, including copper, is destined for consumption.

It now seems to be generally recognized that the plans for a grand copper merger have been abandoned. This fulfils our prophecy of last December. While there may be some disappointment to some persons who contemplated unloading at inflated values stocks that are of the nature of incubuses, we think that the welfare of the industry is best conserved by letting developments take their natural course.

The accounts of the recent eruption of Mount Etna, telling of the stream of lava running down its flanks and spreading over them, enables us to picture vividly in the mind the manner in which the formation of volcanic rocks occurred in the Tertiary age.

Metallics

Cerium is an iron-like metal which becomes malleable on warming and melts at 623 deg. Centigrade.

In drives that are within, say, 20 ft. of other workings, blasts should never be fired without first warning the men in those workings.

There is a tendency to employ stronger material in the Rand mining work. In new mills, "concrete steel" is being used, and concrete is now employed in a number of shafts.

The U. S. Geological Survey calculates that the fire loss in the United States is eight times the per capita loss of any country in Europe, and that it amounts to $1,500,000 per day.

The principal minerals which are of importance in the production of the rare earths are cerite, euxenite, fergusonite, gadolinite, keilhauite, monazite, orthite, samarskite, thorite and xenotime.

Barite, on account of its prismatic cleavage, forms a "sliver" pigment rather than a granular one. It is entirely unaffected by weather, and does not dissolve like zinc, nor blacken with sulphur like lead.

It is a habit of millmen in general to increase the length of the stamp stem by welding on pieces of varying length, thus adding to the weight of the stamp. This practice is not to be recommended as the weight so added is not effective from the crushing point of view owing to the elasticity of the material.

In order to obtain the maximum efficiency from a stamp, it is necessary to make arrangements for the immediate removal from the mortar box of all particles suitable for regrinding in a secondary machine as soon as the stamp has done its work, and this is accomplished by a coarse screen and an efficient water feed.

A check valve and a stop valve should be placed in the feed pipe to each boiler, the stop valve being between the boiler and the check valve, so that repairs can be made to the latter while the boiler is under pressure. Feed pipes and check valves should always be arranged so that the water cannot back out of one boiler into another.

Diamond-drill cores are valuable to the geologist, and much time would be saved if the cores are preserved in a systematic manner. The cores themselves may be cheaply and systematically packed in ordinary dynamite boxes, if a definite order of deposition be adopted. Longitudinal divisions are unnecessary, but horizontal separation is desirable.

A blackboard should be provided at every mine where the men coming off shift can record the place where they have left missed holes and the number of them. A miner after blasting should always remain near enough his working place to hear the reports, and even if several men work in the same stope it will generally be possible to count the total number of reports.

Experimental examination of the reduction of sodium sulphate by heating with lampblack shows that it is hardly sensible below 950 deg. C., but is rapid and uniform at that temperature, whatever be the proportion of carbon. With excess of carbon ($Na_2SO_4 \times 4C$), 70 per cent. of the sulphate is decomposed in 20 min., and the speed of reaction increases rapidly with the temperature.

Boron is a poor electrical conductor at ordinary temperature, but its conductivity at a dull red heat is about 2,000,000 times greater than at 23 deg. C. Its hardness is inferior only to the diamond. On account of its remarkable electrical properties, boron can be used technically in the production of motor-starting devices, sensitive pyrometers and bolometers, wireless detectors, etc., while its hardness and conchoidal fracture make it suitable for jewels and dies.

By the Way

A consulting engineer is a necessity to many mines, but some cases could be cited where the chief need of the property is a real live prospector.

The *Northwest Mining News* says that because a competent judge decided that a jackass was the discoverer of the Bunker Hill mine every jackass in the country should not imagine that mines are discovered and made more surely by the novice than the man who devotes his time and talent to the business.

Can a man *voluntarily* assume a risk (such as the hazards of mining) when his job depends upon whether or not he voluntarily (?) does so? A case in point is a long list of rules (where close observance would not tend toward the establishment of friendly relations with the shift boss) printed by a certain mining company, and to be read and signed by each employee. A little sentence above the line left for the signature says "I voluntarily assume the hazards," etc. Any hesitancy a man may feel about signing one of these documents is usually removed by the comforting reflection that the paper will not be upheld by any court.

A correspondent sends us the bulletin of a company that is evidently going to do some prospecting at Bisbee, which contains the following communication from a "practical engineer of a great many years' standing": "I have traveled over Arizona in and out several times and am one who knows your property will become as good as any in Arizona. You want to, in my opinion, get down below water level, where the mineral cooled off, then you will get good ore. As good as any in the mines. You are in the section where the Anticline or Submerged 'Chimney' is plainly in evidence. In fact I judge from your developments up to date it is of the True Fissure Upheaval, Chimney, Cinders, Slickensides, and Talc, combination, which has never known to return anything but a continuous vein of ore to 4000 ft. depth, where you will quit, from the fact that copper will be a solid mineral or metal." Our correspondent inquires if this be not the limit. Oh! Beck. Oh! Posepny. But the president of this joyous company proceeds to quote "another eminent mining engineer" and there we had to pause.

You can't keep a good man (or country) down. We had thought that the good old days were past when the wildest kind of a fairy tale coming from Nevada was the signal for serious conferences in the back rooms of business houses in many States; when one small specimen, aided and abetted by the fevered imagination of a prospector who, immediately upon finding the said specimen, and without indulging in such foolishness as waiting to do a lot of toilsome digging, started a stern chase after his burro on the back trail to the nearest combined saloon and publicity office, was enough to start a brand new department in the market letters. In those times it was a poor day that did not see the launching of "another Cripple Creek." But the cry of wolf came too often and some sundry "mining men" hiked back to the San Francisco race track to the tune of "Walk, you sucker, walk." Then Nevada settled down and did a little digging, with the result that she owns a Goldfield and a Tonopah and an Ely, but a large assortment of budding "Cripple Creeks" went back to nature. Nevada got restless, however; they took away her gambling houses and wanted her to go to sleep and give the stockholders a show.

"This is no country to sleep in," said Nevada, "let's have a little action." So here comes Jarbidge. Now, we don't know anything about Jarbidge except what we are told, but the "dope" from there has a strangely familiar ring. We like new camps and new mines; we are only waiting for a chance to get in line and shout "Hurrah for Jarbidge!" We do not deny that Jarbidge is the "greatest, most wonderful, etc.," in existence, that "Goldfield and Tonopah will be taken off the map." No, we do not deny it—but it may become necessary, unless Jarbidge does considerably more digging, and less talking about "80-ft. veins of high-grade gold ore"; *et tu* Kimberley.

March Dividends

The accompanying table shows the amount per share and total amount of the dividends paid during March, 1910, by a number of mining and industrial companies in the United States, Canada, and Mexico.

U. S. Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Bunker Hill & Sull., s.l.	Ida.	$0.25	$75,000
Butte Coal, c.	Mont.	0.25	250,000
Calumet & Arizona, c.	Ariz.	1.00	200,000
Calumet & Hecla, c.	Mich.	8.00	800,000
Colorado, s.l.	Utah	0.10	100,000
Doe Run, l.	Mo.	1.50	98,674
El Paso, g.	Colo.	0.01	24,500
Federal M. & S., pf., s.l.	Ida.	1.75	180,000
Hecla, s.l.	Ida.	0.02	20,000
Homestake, g.	S.Dak.	0.50	109,200
Internat'l Sm. & Ref.	Utah	2.00	200,000
Iron Blossom, s.l.	Utah	0.08	80,000
Nevada Con., c.	Nev.	0.37½	431,700
North Butte, c.	Mont.	0.50	200,000
North Star, g.	Cal.	0.30	75,000
Quincy, c.	Mich.	1.50	165,000
Round Mountain, g.	Nev.	0.04	32,000
St. Joseph, l.	Mo.	0.15	150,000
Snowstorm, c.	Ida.	0.01½	22,500
Utah Copper, c.	Utah	0.75	550,219
Yukon Gold, g.	U. S. and Can.	0.10	35,000

Foreign Mining Companies.	Situation.	Amt. per Share.	Amt. Paid.
Buffalo, s.	Ont.	$0.03	$30,000
Kerr Lake, s.	Ont.	0.50	300,000
La Roi No. 2, c.	B. C.	0.48	57,600
Peregrina, pf., g.s.	Mex.	3.50	35,000
Rio Plata, s.	Mex.	0.10	37,344

U. S. Industrials.	Situation.	Amt. per Share.	Amt. Paid.
Amer. Coal	Md.	$0.75	$37,500
Gen. Chem., com.	U. S.	11.25	833,659
Nat'l Lead, pf.	N. Y.	1.75	426,433
Sloss-Sheffield	Ala.	1.25	125,000
Standard Ore	U. S.	15.00	14,550,000
U. S. Steel, com.	U. S.	1.75	8,895,293

Chronology of Mining for March, 1910

March 2—Explosion of powder magazine in Alaska-Mexican mine, Treadwell, Alaska; 37 killed.—Homestake mine, South Dakota, announced full resumption after strike of November 23, 1909.—Floods in Nevada stopped railroad traffic and interfered with ore movement.

March 4—Skookum camp, 20 miles north of Roslyn, Wash., wiped out by avalanche. Superintendent E. L. Simmons killed.

March 6—Fire destroyed No. 1 bunker of the Nay Aug Coal Company, near Scranton, Penn. Loss $60,000.

March 7—Strike of engineers in Butte (Mont.) mines ended.

March 12—Seven miners killed by gas explosion in No. 3 shaft of the Lehigh & Wilkes Barre Coal Company.

March 16—The Government filed suit against Anaconda Copper Mining Company to compel it to abate smoke nuisance.

March 17—Prairie Oil and Gas Company advanced price of crude oil in the Midcontinental field, the first advance in three years.

March 23—Collapse in price of shares of Granby Consolidated Mining, Smelting and Power Company.—Anaconda Copper Mining Company increased capitalization to 6,000,000 shares, or $150,000,000 to absorb Amalgamated Copper properties.

March 24—Commonwealth mill, Pearce, Ariz., burned; loss $150,000.

March 26—Montezuma Mines Company, of Costa Rica, filed petition of bankrupcy.

March 28—The Butte & Superior Copper Company purchased the North Butte Extension property at Butte.

The World's Production and Consumption of Copper

We give in the accompanying table the copper production and consumption of the world, as compiled and estimated from the statistics of the different countries by Aron Hirsch & Sohn, of Halberstadt, Germany. The figures are given in long tons.

	Production.	Consumption.
United States	487,020	.....
Canada	21,420	.....
Mexico	56,250	.....
Newfoundland	2,100	.....
North America	566,790	314,755
Germany	23,500	194,449
Spain	53,000	.....
France	.....	85,688
England	.....	110,648
Austria	1,750	34,605
Russia	18,450	21,705
Italy	3,200	25,189
Scandinavia	12,500	9,700
Other Europe	2,000	12,500
Europe	114,400	494,484
South America	57,400	2,500
Japan	45,000	10,000
China	.....	10,000
Africa	7,000	.....
Australia	38,350	2,000
Miscellaneous	6,000	.....
Total	834,940	833,739

The production of South America is made up of 35,800 tons from Chile, 19,000 from Peru and 2600 from Bolivia.

From these figures it would appear that the production for 1909 exceeded the world's consumption by only 1201 tons. Nevertheless the visible stocks at the close of 1909 are given at 167,454 tons, an increase of 63,603 tons. This apparent difference results in part from the difficulty of comparing the statistics from many countries, which do not all correspond; but in large part from the appearance in the consumption—that is, in the totals of manufactured copper in its various forms as reported—of old copper, scrap and reworked material which do not appear in the statistics of production; and which are not, in fact, part of the production, though appearing in the output of the metal in its various finished forms.

Accident to D. W. Brunton

The following is from a private letter from Mr. Brunton, which we feel at liberty to reproduce in view of the interest in the details of his accident that is felt by his numerous friends:

"At present, I am stretched out on my back in bed as the result of an automobile accident on March 25. I started from Fort Collins for the Laramie tunnel with the vice-president and shipping agent of the company in their automobile, and about 50 miles northwest of Fort Collins, while going down a tremendously steep grade, the chauffeur lost control of the machine, and we plunged down the mountain side into the cañon below. Mr. Hibbard, the vice-president of the company, who was sitting beside me, was instantly killed. Mr. Akins, the shipping agent, had both arms broken and his face very badly cut, while the chauffeur escaped practically unhurt. I was thrown 25 or 30 ft., knocked senseless and sustained severe contusions of the right arm and right leg. I am still suffering a great deal of pain, and am unable to move or have my right leg moved in any way, but the surgeon thinks the worst will be over in a few days, and that I shall be as good as new in a couple of months."

Abrasives in 1909

There was a large increase in the production of artificial abrasives in the United States in 1909, directly due to the great activity in the trades in which the material is consumed. The total production was far in excess of that of any previous year and was more than double the output in 1908. The accompanying table, compiled from statistics collected for "The Mineral Industry," shows the quantity and value of the alundum, carborundum and crushed steel produced in this country in 1908 and 1909.

	1908, Lb.	Value.	1909, Lb.	Value.
Alundum	3,160,000	$189,600	13,578,000	$ 814,680
Carborundum	4,907,170	294,430	6,478,290	388,697
Crushed steel.	630,000	44,100	818,000	57,260
Total	8,697,170	$528,130	20,874,290	$1,260,637

Platinum Exploration in Russia

No important discoveries of platinum were reported from Russia in 1909, the production being obtained from the old placers. The Russian Permanent Geological Committee detailed some geologists to make researches in the northern Urals. Their work showed that platinum was present in some of the olivine rocks of the district. In several places outcrops of olivine reefs were discovered which carried traces of metal, but none of these proved to be of any industrial value.

DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

Self-Dumping Bucket for Winze

BY LAWRENCE MAY*

The self-dumping bucket arrangement shown herewith, was designed to meet peculiar conditions for handling ore underground; large capacity was also required. As the shaft is a winze shaft and in extremely hard rock, work above the station level is expensive. Accordingly, the cost of a skip installation put it out of consideration, and the arrangement of this bucket on a crosshead, with platform for men and timber was installed.

The bucket is rectangular, 24 in. wide, 30 in. long, and 30 in. deep. A lug projects 3 in. from the side and is set behind the center. Two "ears" on the upper rim of the bucket are drilled for safety hooks hung from the crosshead with flexible steel cables.

The door upon which the bucket dumps its contents is mounted on the shaft *N;* at *A* a heavy piece of angle iron on the under side of the door projects beyond the shaft timber, and to it are attached the ropes which operate the door. To allow this angle iron to pass, the guide is cut at *C*.

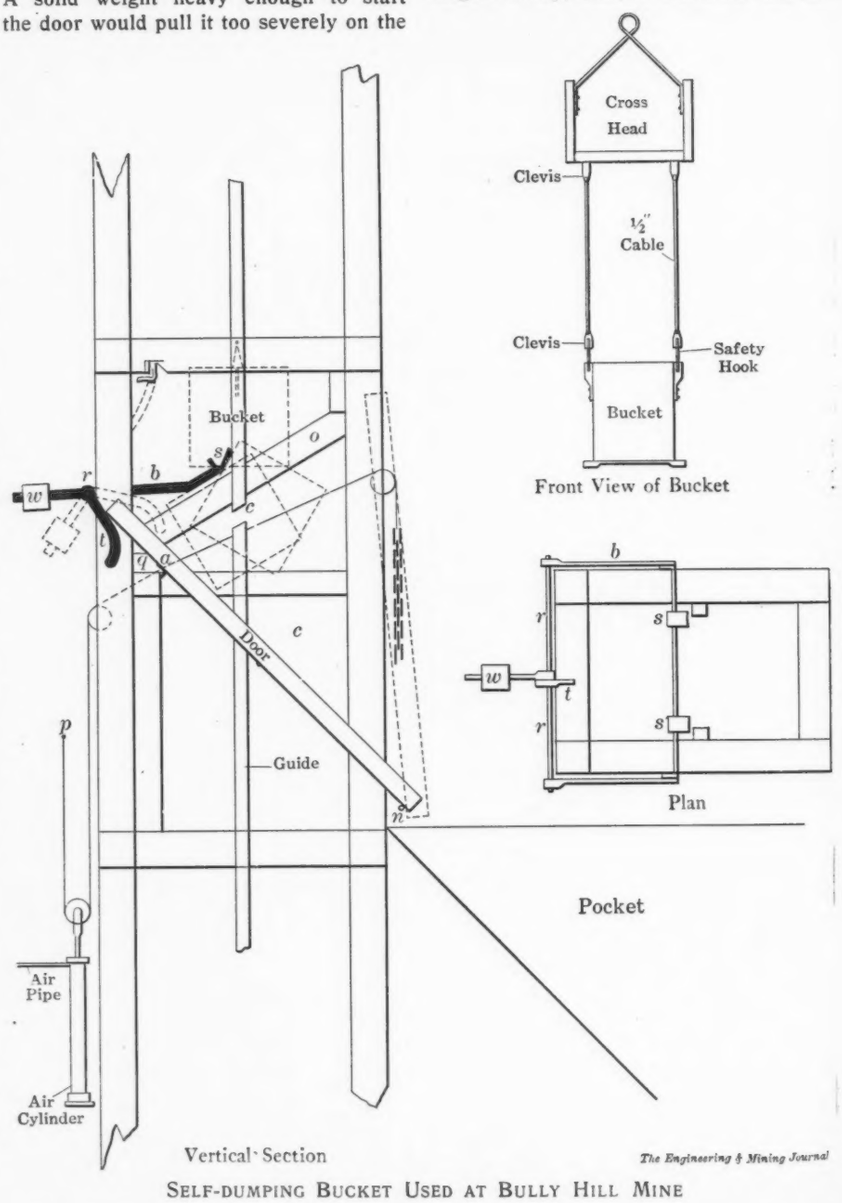
The dumping mechanism consists of the two arms *B,* to which is bolted a heavy iron strip carrying two stirrups *S,* the trigger arm *T,* and the weight arm *W,* all firmly keyed on the shaft *R*. In operation, the bucket is hoisted far enough to clear the door. The engineer then throws a three-way valve, admitting compressed air to the cylinder shown. The piston is forced down, pulling the door by the arm *A,* to its closed position on the bumper *Q*. As the door descends, it strikes the trigger *T,* throwing the dumping mechanism into the position shown by full lines. The bar holding the stirrups rests on the timbers *O*. The whole gear is now held in position by air in the cylinder. The engineer lowers the bucket, the lugs drop into stirrups *S,* and the bucket dumps its contents on the door by turning about the lugs as an axis. After dumping, the bucket is raised to clear the door. The engineer releases the air in the air cylinder. The chain counterweight pulling on arm *A,* draws the door into its clearance position. As the doors rises, the weight *W* causes the dumping mechanism to assume the position shown by dotted lines and the shaft is clear for lowering the bucket. The bucket drops on a low truck, is quickly unhooked and run away. A loaded bucket is run under the crosshead, hooked on, and is ready for hoisting.

A large weight is needed to start the door up, but less and less as it ascends. A solid weight heavy enough to start the door would pull it too severely on the finish. Therefore a chain is used, and after the door starts and moves a few inches, the end of the chain rests on a platform. As the door ascends more and more, weight is taken off the pulling rope, by the chain piling up on the platform. Thus the door is almost perfectly counterbalanced in any position and operates smoothly.

*Mining engineer, Bully Hill Copper Mining and Smelting Company, Winthrop, Shasta county, Cal.

Station Marker for Hoist

A simple and accurate arrangement is used on a number of the hoists about Angels Camp, Cal., to mark for the engineer the position of the cage. A light toothed wheel is shrunk on the end of the axle of the drum. This wheel engages another similar smaller wheel which rotates a slender spindle on which is wound and unwound a light chain. The chain passes up over a pulley and terminates in a weighted pointer traveling between the upright indicator boards.



SELF-DUMPING BUCKET USED AT BULLY HILL MINE

Useful Knots for Engineers—II

By A. Livingstone Oke*

Fig. 13, *Bowline on a Bight*—The part marked *A* is passed behind *B* and then in the direction of the arrow to *C*. The bight *B* is then pulled taut. The two loops of this knot may be used as a man sling, a barrel sling, or as a double man-harness, one loop under each shoulder. When tightened it will not slip.

In using this knot for lowering a man into native or other old workings in countries where snakes are encountered, it is well to put only one leg through the two loops. Also, in case of an injured man, one of the loops can be kept shorter than the other and adjusted under the arm-pits, the man being seated in the larger loop. This may also be done to allow freedom for the arms when taking samples in winzes or shafts.

Fig. 14, *Open-hand Loop Knot and Figure-8 Loop Knot*—The upper loop knot is the one in common use and is adapted principally for small ropes. The lower, or Figure-8 knot, is a better form and may be used on a larger rope as it injures the fiber less than the common form. These knots require a greater length of rope than the bowlines, but may be used in similar ways.

Fig. 15, *Man-harness Knot*—This knot can be tied in a rope with neither end free. The bight *A* is pulled through under *B* and over *C*, and the knot pulled taut. It is useful as allowing a number of men to get a good purchase on a rope for hauling; also to put loops in the rope to receive hooks at points other than the ends.

Fig. 16, *Packer's Knot*—This knot is a modification of a simple slip knot, but has the advantage, when pulled tight, of biting on the standing at *A* and not easily slipping back. It is particularly useful for cording up rolls of camp bedding, etc. It can be made permanent by an added half hitch on the standing.

Fig. 17, *Blackwall Hitch*—A convenient method for returning an empty rope on a hook. With a greasy rope, method *B* holds better.

Fig. 18, *Modified Fisherman's Bends*—These are given as alternatives for securing ropes to poles or bars, and are adapted to heavy strains.

Fig. 19, *Fisherman's Bend*—This is a better method than the gooseneck or lark's head (Fig. 20) for securing a rope to a chain or link. It is also used to fasten the rope to a bar or the bail of a bucket. Lashing at *A* is necessary to prevent pulling through. As shown in first position, two turns are taken over the link and the end brought back in front and passed through the turns as shown dotted.

Fig. 20, *Lark's Head*—This knot is useful for fastening a rope to the link of a chain or to a ring in a wall or box. It is not a secure knot unless lashed at *A*. *B* shows a toggle inserted to prevent slipping. *C* is a modified gooseneck on a bar, suitable for securing the end of a rope in scaffolding. The end must be placed at the back and the whole pulled taut.

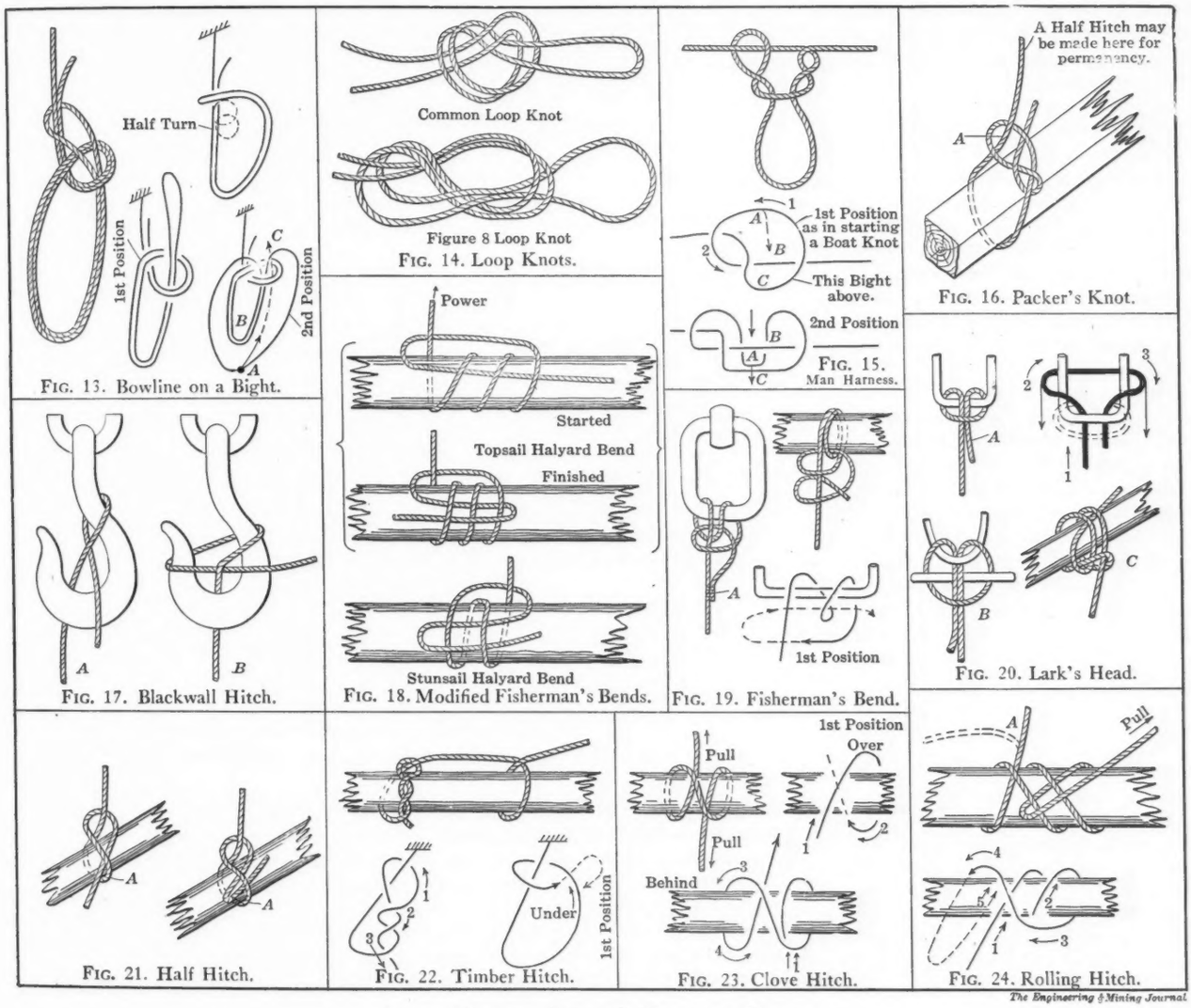


FIG. 13. Bowline on a Bight.
FIG. 14. Loop Knots.
FIG. 15. Man Harness.
FIG. 16. Packer's Knot.
FIG. 17. Blackwall Hitch.
FIG. 18. Modified Fisherman's Bends.
FIG. 19. Fisherman's Bend.
FIG. 20. Lark's Head.
FIG. 21. Half Hitch.
FIG. 22. Timber Hitch.
FIG. 23. Clove Hitch.
FIG. 24. Rolling Hitch.

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LOOPS, HARNESS, PACKER'S KNOT AND HITCHES

Fig. 21, *Half Hitch*—This is a simple knot, but is not secure unless lashed at *A*.

Fig. 22, *Timber Hitch*—This is a useful knot for dragging timber, as the pull is in the direction of the grain of the wood, and the knot will not slip.

Fig. 23, *Clove Hitch*—This is a useful knot for fastening a rope to a post or rail, as it can be tightened or loosened at will. It is not secure unless lashed at *A*.

Fig. 24, *Rolling Hitch*—This is a useful knot for fastening a rope to a rail or bar, as the pull is in the direction of the grain of the wood, and the knot will not slip.

*Mining engineer, Argentine and General Exploration Company, Ltd., Rodeo, San Juan, Argentina.

Fig. 21, *Half Hitch*—A quick and simple way of securing a rope to a timber when no great pull is expected. The rope end is placed under the pole, then back over to the right as shown. The end must always be placed right at the back away from the pull, as shown at *A*. The right-hand sketch shows the hitch with a slip to facilitate undoing.

Fig. 22, *Timber Hitch*—This is the best and simplest of all timber hitches and may be used for towing or otherwise handling timber, rods, pipes, etc.; also for starting lashings on scaffolding or any kind of pole work. For raising or lowering timber, the half hitch should be placed high above the center of gravity to avoid slanting.

Fig. 23, *Clove Hitch*—This is one of the most useful of all hitches, as it will take a strain in either direction without slackening. It is used for mooring ships, heads of derricks for guy lines and all kinds of rigging work. It is easily undone, or a bight may be put in instead of one end to use as a slip. When commencing to tie the hitch on a horizontal bar, the rule is over and back below, or the reverse of the procedure in tying a half hitch.

Fig. 24, *Rolling Hitch*—This lashing is used for getting a grip on a large rope with a smaller one. Made in chain it can be applied to wire ropes and will not slip when the load has been taken up. It is also suitable for hauling on electric cables, or withdrawing diamond-drill or other rods. For securing the end *A* may be brought down and lashed to the large rope. In making, the end is passed over the spar twice, then returned back as shown at (3), then over behind as at (4) and up and under as at (5).

(To be continued)

Wear on Filter Leaves

In transferring vacuum-filter leaves into the wash tanks the greatest wear comes on the corners, which are liable to scrape against the sides of the tanks. As soon as the canvas is worn through in one place the leaves are, of course, rendered useless. Heavy canvas patches sewed over the corners of the leaves, will take up this wear and greatly increase the life of the leaves.

At the Montana-Tonopah cyanide plant solutions are kept at an alkalinity of ¾ lb. CaO to the ton in order to facilitate settlement of fine slimes. This results in the formation of an excessive amount of $CaSO_4$ and necessitates washing three leaves from each box of 62 every 24 hours. A wash of 2 per cent. HCl is used. As there is only 2 in. of clearance in the filter boxes, the ends and corners of the leaves soon became worn through, before the simple scheme of reinforcing with corner patches of extra thick canvas was hit upon.

Method of Handling Slimes and Tailings

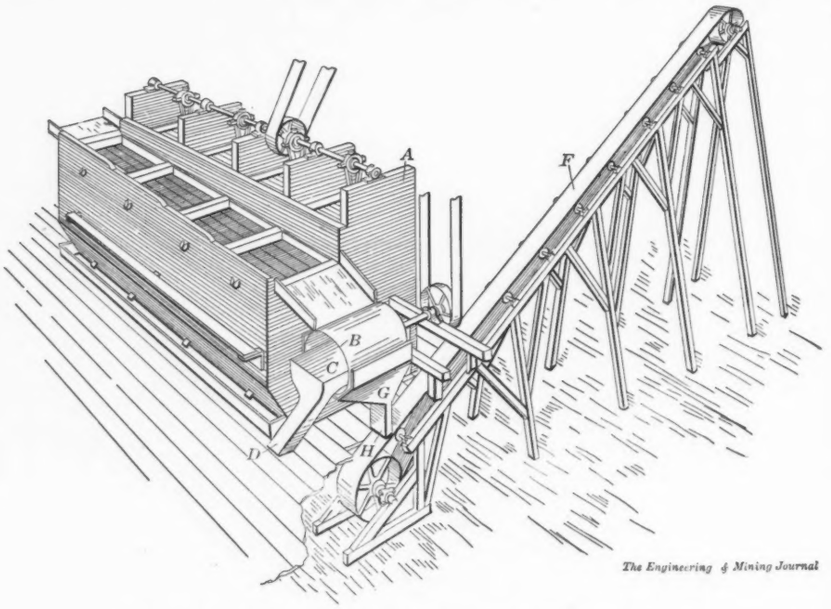
By A. O. Ihlseng*

The accompanying sketch gives a view of the general arrangement of a device for dewatering tailings and disposing of them in a more economical manner than has heretofore been the practice in the Joplin district. I have always considered that the method of handling tailings from the mills could be improved upon, and that the losses of zinc and lead in the fines and slimes carried away were too high, and that some method of separating the water and fines from the tailings should be utilized. This also left the matter of tailings disposal to be solved.

Dewatered Tailings Handled by Belt Conveyer

The disposition of the dry tailings was then the problem to be solved. At first the tailings were supplied with water from the slime tables to be carried up by the ordinary tailing elevator and distributed to the waste pile. This method of distributing tailings is crude and unsatisfactory in many ways, though its simplicity and crudeness are its chief recommendations. Having the tailings dry, a means was looked for to dispose of them readily. The use of a car and incline, such as is used in handling slate and waste at the coal mines, was tried. This was found to be satisfactory only to a limited extent, as it required labor and attendance.

Shortly after severing my connection



Dewatering Device and Belt Conveyer for Jig Tailings

with the Oronogo-Circle company I erected one of the largest mills in the district at Galena, Kan., for the Eureka Mining Company, in which I was personally interested. I was determined to provide more economical handling of the tailings, and adopted a 14-in. belt conveyer, something which had never been suggested or attempted in the district. The conveyer has a capacity of 60 tons per hour when traveling 150 ft. per min. The tailings from the screen fall into the chute *h*, and on the conveyer belt *f*. The belt runs on concave rollers placed on the frame. The tailings are dropped at the head of the belt until the pile accumulates to a hight where other distribution is required. A 2-in. centrifugal sand pump takes the tailing water from the slime tables, and pumps through a 2-in. pipe laid on the side of the conveyer frame. This stream of water enters the box into which the tailings from the belt fall, and the mass flows out in the or-

While manager of the Oronogo-Circle properties I found an excessive loss in fines. After considering the various screens and devices in use for separating sludge, as the fines and slimes are called in this district, I decided to experiment on simpler lines. I installed at the end of the jig a revolving screen, *b*, 36 in. wide and 30 in. in diameter, of one millimeter mesh. This screen is supported at one end by a shaft, and is driven 10 r.p.m. by a belt from either the jig shaft or any convenient shaft. The pan *c*, suspended in the screen, is supported on the outside. The water and tailings drop on the screen, *b*, and the tailings fall into the hopper *g*. comparatively dry. The water and fines drop in the pan *c* and are carried by the trough *d* to settling tanks, where the slime is allowed to settle for future treatment. The screen is exceedingly simple, efficient and easily kept clean. The separation is perfect.

*Consulting engineer, Joplin, Mo.

dinary iron-trough tailing distributers. The arrangement shown in the illustration accomplishes two distinct purposes: It save the fines, and handles the tailings cheaply.

Cost of Tailings Elevators

The experience in this district in handling tailings makes this form of distribution attractive. The usual tailing elevator of a 300-ton plant costs $1000 for frame, 20-in. belt, elevator cups, troughs, etc. Such an elevator is 60 ft. high, and delivers the tailings 80 ft. from the mill at an actual hight of 30 ft. It requires about 5 h.p. to operate. In winter the water freezes, and the outside troughs break down with the weight of ice, and frequent accidents occur to the men working on the troughs and head of the elevator. The belts and cups of the elevator must be renewed every six months, or less. Each renewal entails a cost of $350, exclusive of labor. The elevator belts break down frequently as they become worn. The actual loss by stoppage and breakdowns of these elevators amounts to $2500 annually, making the actual maintenance expense run up to $3000 or $3500 annually as a minimum.

Compare the above with the belt conveyer. The entire conveyer costs $500 to install. It will run two years with but little repair. There is nothing to get out of order. A renewal belt costs $125, and can be put on in two hours. A belt conveyer will deliver the tailings at a hight of 32 ft. at the same distance from the mill the tailings elevator delivers its tailings. This is a gain of two feet. Further, the low structure eliminates all accidents.

The conveyer can be extended indefinitely, while the only method of extension in the ordinary tailings elevator of the district is to build an auxiliary, or "dummy," on top of the tailings pile.

Altering Stamp-Mill Foundations

At the Simmer and Jack Proprietary mines, Transvaal, it was found necessary to consider seriously the "re-conditioning" of the mill foundations. C. O. Schmitt, at a recent meeting of the Institution of Mining and Metallurgy, said that this work could have been done more or less successfully by patching up the existing foundations; but, in order to meet a possible future increase of the tonnage to be milled if considered advisable, it was decided to do the work so as to permit of an increase in the weight of the stamps. Figs. 1 and 2 show the battery foundations before and after the alterations.

The stamps as this mill have a new weight of 1250 lb. and an average running weight of 1150 lb., while after the alterations as shown it is considered that an average running weight of 1400 lb. will be permissible, taking into account the size of cam shaft and stem. This represents an increase of 21.74 per cent. on the old weight and will permit of a similar increase in the stamp duty. In addition to the mere increase in stamp duty a greater efficiency is to be expected since the heavier stamp is more likely to reduce the maximum size of ore fed to the mortar box, say 2-in. cubes, in one blow to the fineness required for passing through the screen.

Fig. 2 is merely diagrammatic and does not show all the alterations made. Besides providing the mortar box with a substantial concrete foundation, the king-posts were cut off and are now mounted on heavy cast-iron shoes which permit of holding the posts firmly in place. The bearings of the mill line shafting are also provided with new foundations, thus making them independent of the ore bin and assuring a true line for this shafting quite irrespective of whether the bin is empty or full. The cam-shaft platform was also rebuilt and it is now carried on columns standing on the foundations, thus avoiding the vibrations always experienced if the platform is supported by the king-posts. This portion of the work, although not affecting the crushing capacity of the mill, is nevertheless important, as it enables the operators to perform their work in comparative ease and comfort.

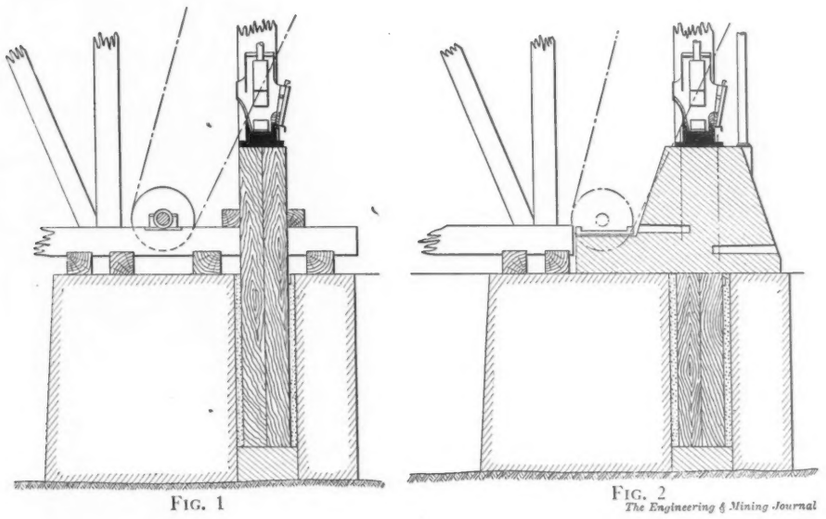


FIG. 1

FIG. 2
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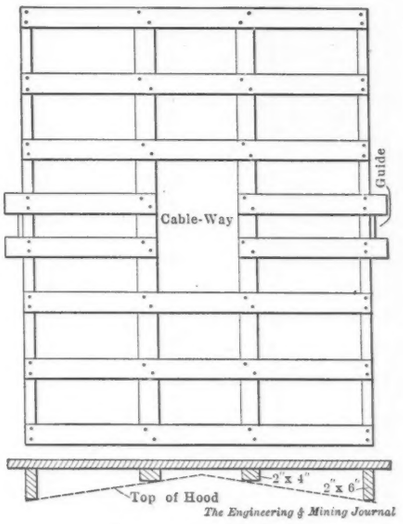
STAMP MILL BEFORE AND AFTER ALTERATIONS

Shaft Cover

The accompanying illustration shows a shaft cover that is in use in the Southeast Missouri lead district. It is simply a wooden frame which is slightly larger than the shaft. There is an opening in the center through which the cable runs. As the cage comes up the hood strikes the wooden frame and lifts it. When the skip or cage descends the frame goes down to the collar of the shaft and remains there until the cage comes up.

Another device which accomplishes this same end is a gate in front of the shaft. This gate is lifted as the cage comes up. When the gate is thus open, the cage covers the shaft. As the cage goes down the gate is dropped in place, thus closing the entrance to the shaft.



COVER FOR SHAFT

Economy of Tube Mills

In a tabulation based on a comparison of results from 75 stamps and one tube mill vs. 75 stamps and four tube mills, C. O. Schmitt shows that the capital, interest and operating costs of the two plants when based on pulps of equal fineness are as 35 to 46 in favor of the larger number of tube mills. In other words, a saving of 30 per cent. on capital account is made by providing one tube mill for every 17 stamps instead of one for 75 stamps, with a saving of 24 per cent. on the sum of capital charges and working costs.

Conditions in the Yerington Copper District

Several Developed Mines Awaiting Construction of Smeltery; Ores Contain from 3 to 6 Per Cent. Copper; Labor and Living Conditions Good

BY JOHN TYSSOWSKI

There is little actual mining activity in the Yerington copper district of Lyon county, Nevada, at the present time. The attitude of mine owners and operators is one of awaiting developments in the railroad and smeltery situation, as without transportation and smelting facilities close at hand only the highest grade of ore can be mined at a profit. The Nevada Copper Belt Railroad is now running trains as far as Mason, two miles beyond Yerington, so the mines can well afford to wait a little longer until the smeltery is also built. The larger properties already have considerable tonnages of ore blocked out for stoping.

Mason valley is a broad, level, north-and-south basin through which the Walker river flows for about 23 miles before heading east and south for Walker lake. The average width of the valley is about seven miles and the land is fertile wherever water is available for irrigation. Potatoes and hay are the principal crops raised, and pasturage is afforded for many cattle. Numerous ranches dot the valley, which is settled to quite an extent.

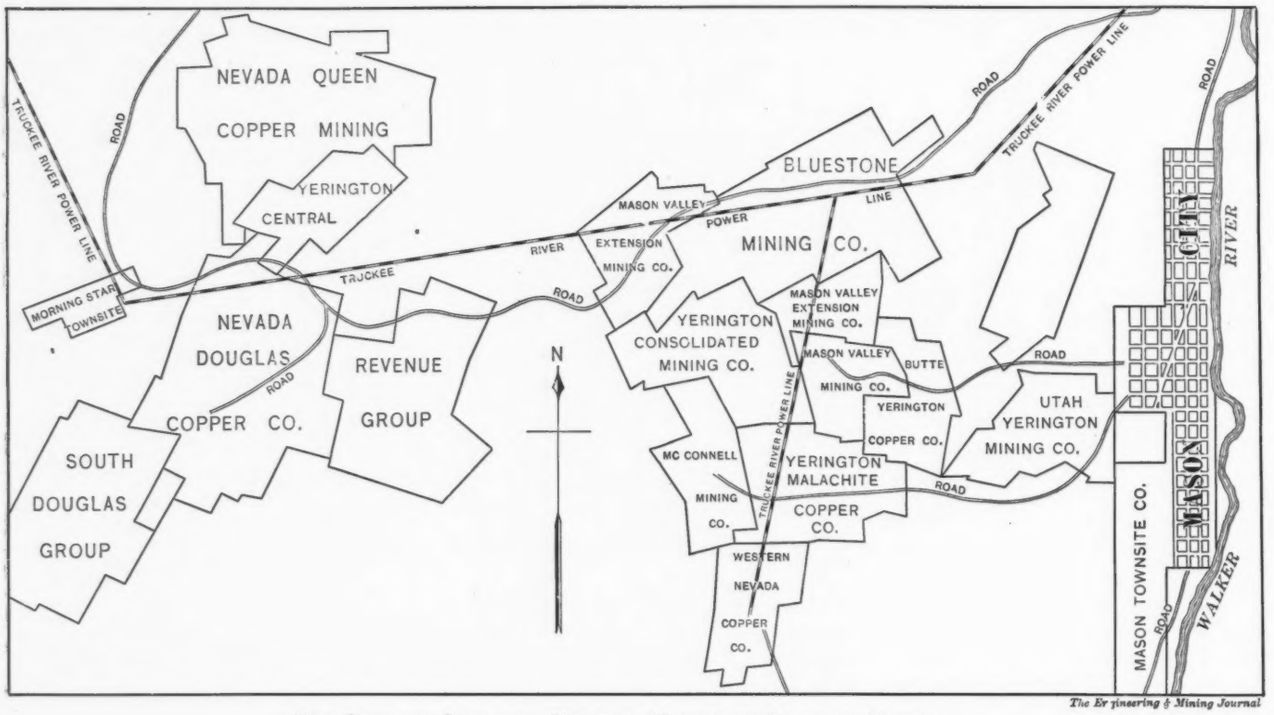
The Copper Belt railroad leaves the Hazen-Mina branch of the Southern Pacific at Wabuska and passes Mason townsite, 14 miles farther south. It will then go to the head of Mason valley, and thence turning to the north, will extend up Smith valley to the Nevada-Douglas properties, a total distance of 38 miles from Wabuska.

In close proximity to Mason, on the west flank of the valley, are the Bluestone, Mason Valley, Malachite and Western Nevada mines. About five miles eastward, on the other side of the basin, are the Blue Jay, Yerington Copper and other mines of the eastern belt. From Mason, by wagon road across the hills, only eight miles to the west, is the Nevada-Douglas group situated on the east flank of Smith valley which practically parallels Mason valley.

Economic Conditions

Living is fairly cheap in the district, at least for Nevada, the adjoining country furnishing almost all the necessary foodstuffs. Non-union labor is plentiful, the prevailing scale of wages being $3 for muckers and $3.50 for machine men. The Truckee River General Electric Company supplies electric power at $5 to $6 per h.p. per month, depending upon the size of the installation. Lumber sells at $30 per M, but little is required in the mines as far as present developments show. Gasolene can be put down at the mines for 25c. per gal., and a plentiful supply of water may be had anywhere in the Mason or Smith valleys by sinking shallow wells. This must be pumped to the mines against heads varying up to 1000 feet.

The published freight rate for hauling ore on the railroad from Mason to Wabuska is 3¾c. per 100 lb. for ore and concentrates not exceeding a value of $50 per ton; 5c. per 100 lb. from $50 to $100 per ton; 8c. per 100 lb. from $100 to $300 per ton. With a smeltery at Wabuska this would of course be the total freight charge. At present it is difficult to haul ore from the vicinity of Mason to Wabuska for $3.50 per ton. Aerial trams will probably be installed to deliver ore to the railroad.

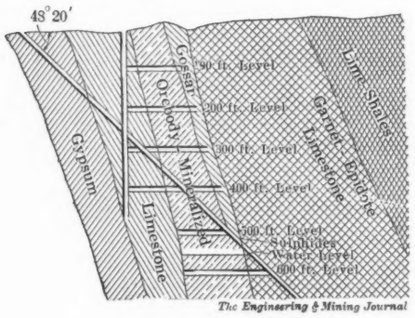


MAP SHOWING PRINCIPAL MINES OF YERINGTON DISTRICT, NEVADA

The Mason Valley Group

As indicated, the mines of the Yerington district naturally fall into three geographical groups, i. e., those on either flank of Mason valley and those to the west and across the range on the east slope of Smith valley. The Mason Valley mine, of the group on the west slope of the Walker River basin, is the only one in the district now being actively developed. This property, controlled by Gunn-Thompson Company, of Salt Lake City, is employing about 20 men under J. J.

Welch, superintendent. The accompanying sketch will give an idea of the vertical extent of the workings. From the No. 1 tunnel the main fissure has been drifted on for about 300 ft. to the east and crosscuts run at intervals into the garnet-lime, ore-bearing formation. On the No. 3 level the fissure has been followed for about 700 ft. to the south and 200 ft. to the north, and the ore crosscut. A winze connects the levels and an intermediate has been opened between the Nos. 3 and 4 tunnels. A filled stope is being started above the No. 3. To the south, on the main or No. 4 level, the ore has been followed to where it is cut off near the end line of the property, and drifting has advanced nearly as far to the north. There are three winzes below the No. 4, one now showing ore at a depth of 70 ft. It is claimed that an ore reserve



SECTION OF LUDWIG OREBODY

of over 600,000 tons averaging 3½ per cent. copper is blocked out. The ore is chalcopyrite and heavy iron sulphide in a garnet-limestone gangue and is claimed to be self-fluxing. Carbonates show near the surface and there is some secondary chalcocite.

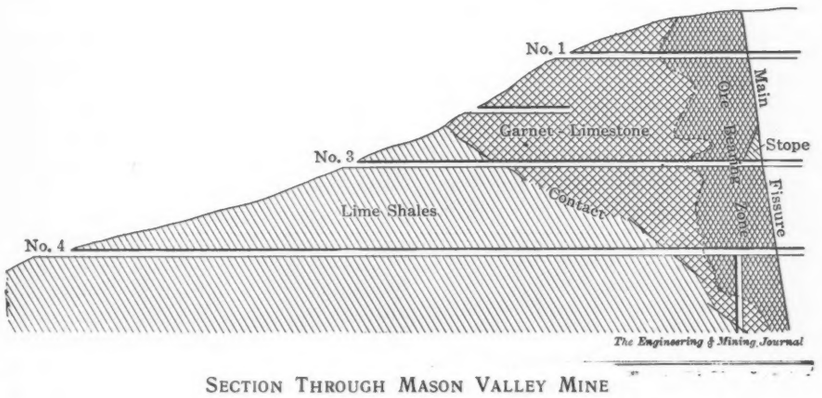
MAGNETIC SEPARATORS TO BE USED ON BLUESTONE ORE

The Bluestone, to the north of the Mason, is probably as well developed as any mine in the region. The company is a close corporation controlled largely in New York: A. C. Weck is in charge of the property. The mine is opened by four tunnels. The ore is a pure chalcopyrite in epidote-limestone, deposited, according to Prof. A. C. Lawson of the University of California, by downward-percolating solutions. After being given a slight roast, the ore will be concentrated on Wetherill magnetic separators at a ratio of 4 tons into 1, which is reported to give a self-fluxing concentrate. At present only about five men are employed about the mine.

On the south of the Mason is the Malachite group, controlled by W. F. Snyder of New York, Grant Snyder of Salt Lake City and O. H. Soune of Yerington. The last mentioned is in charge of the property. Pits and tunnels show surface indications of two zones of mineralization. A shaft has been sunk 150 ft. in limestone. This property is still in the prospect stage; no work is being done at present.

Adjoining the Malachite on the west is the McConnell, controlled largely by E. W. Clark, E. B. Critchlow of Salt Lake City, and F. Pierce. Until recently this property was under option to the Nevada-Goldfield Reduction Company which sunk a shaft 400 ft. in waste. Formerly large shipments of high-grade ore were taken out above the tunnel level and on the outcrop which shows a heavy iron gossan. The ore lies close to the contact of the limestone and granodiorite. The property is idle.

The Western Nevada holdings are situated to the south of the McConnell. Samuel Newhouse, of Salt Lake City, and E. Myers, of New York, control this property, which is developed by two tunnels and a winze 300 ft. below the lower level.



SECTION THROUGH MASON VALLEY MINE

NEVADA-DOUGLAS GROUP

The only developed property on the east slope of Smith valley is the Nevada-Douglas, which groups includes four copper-bearing zones: The Ludwig fissure vein; the Casting Copper, probably a continuation of the above; The Amalgamated and the Douglas, impregnations in an epidote-limestone belt. The accompanying section gives an idea of the development of the Ludwig, which claims 650,000 tons of ore averaging over 5 per cent. copper actually blocked out. Most of the high-grade ore from the oxidized zone extending a little below the 500-ft. point has been taken out, leaving, however, considerable ore which will be of shipping grade. It will require careful mining to recover this ore. Some secondary enrichment shows below the oxidized zone below which chalcopyrite occurs.

The gangue is silicious, and the heavy iron gossan carries copper in varying quantities. Water now stands at about the 540-ft. point, so that the lower workings are not accessible. A 6 x 12-ft. two-compartment incline shaft has been sunk 43 ft. below the 600-ft. level. Four or five men are employed about the surface.

A deposit of gypsum on the footwall of the Ludwig orebody is interesting and will undoubtedly prove of commercial value eventually. Before the Ludwig was acquired by the Nevada-Douglas company a shaft was sunk 85 ft. at the Casting Copper where the compressor plant for the works is situated. A prospect shaft 125 ft. deep and a tunnel 650 ft. long have also been opened here.

The Amalgamated has been prospected only by a few pits and tunnels. At the Douglas, tunnels are claimed to prove 1,000,000 tons of 6 per cent. copper ore. Samuel Arentz is in charge of the Nevada-Douglas operations.

THE EASTERN GROUP

Practically no work is being done on the mines to the east of the Walker river. Of these properties the Blue Jay and Yerington Copper have shafts down about 400 ft., the Butte Yerington has sunk about 300 ft. and the Yerington Copper Mountain 100 ft. All have done considerable surface trenching and tunneling which is also true of all the properties of the Yerington district.

Conditions at the Yerington Copper property are fairly typical of this section. Mineralization occurs in a fissure in monzonite, locally termed granite. The surface showing is good, and a tunnel run 300 ft. on the strike and from a point 260 ft. below the summit of the hill shows up the mineralized zone and some good ore. A shaft is down about 400 ft. to the water level, and drifts and a crosscut at a point near the bottom show from 3 to 6 ft. of mineral-bearing material, with a footwall of monzonite and hanging-wall of highly altered limestone.

These eastern workings are situated at elevations ranging from 300 to 500 ft. above the floor of the valley. The distance across the valley to the railroad is probably five miles in an air line. The roads are good in dry weather, but heavy when the ground is water soaked.

One characteristic of the operations about Yerington is the simple surface equipment; electrically driven compressors, small air hoists and plain buildings.

being general. What money has been spent seems to have been put into the ground. Favored by cheap power and good labor conditions, and having a prosperous agricultural section close at hand, the Yerington copper district is fortunate. The completion of the railroad and erection of the proposed smeltery near Wabuska will supply all that is necessary for the final tryout. Much has been said for and against the district, but there is no doubt that a number of the properties are good prospects and a few certainly show all the indications of being real mines.

Rio Tinto Company, Ltd.

The Rio Tinto Company, Ltd., mined 604,799 tons of ore for shipment in 1909, of which 600,946 tons were invoiced to consumers, and 1,184,188 tons for local treatment, a total of 1,788,987 tons with an average copper content of 2.349 per cent. The copper produced by treatment at the mines was 24,364 tons, and that in the pyrites shipped was 11,008 tons. A total of 35,496 tons of copper were sold. Deliveries of sulphur ore were 569,604 tons as compared to 668,477 tons in 1908.

It is expected to quarry some ore from the San Dionisio lode in 1910, more than 1,000,000 cu.m. of overburden having been removed in 1909. Nearly 1,200,000 cu.m. of overburden were taken from the South lode, but more must be moved before the normal output of the lode can be again attained.

The revenue account shows a surplus at the end of the year of £1,322,265, from which were distributed two 30s. dividends on the 375,000 ordinary shares and two 2s. 6d. dividends on the preferred shares, making a total dividend distribution for the year of £1,206,250. The dividends on the ordinary shares amounted to 60 per cent.

Treatment of Titaniferous Iron Ores

Wilhelm Borchers, Aix-la-Chappelle, Germany, describes (Brit. Pat. 24,590, Nov. 16, 1909), a process of treating titaniferous iron ores, having for its objects the production of iron free from titanium, and a slag useful for metallurgical purposes.

Titaniferous iron ore and carbon are put into an electric furnace and smelted. A deoxidizing agent is added at a temperature of about 2000 deg. C., in sufficient quantities to extract the greater part of the iron and silicon present. The resulting products are a crude iron containing all or nearly all of the silicon of the ores, and a slag with a small amount of iron but a large amount of titanic acid. For the success of the process only a small quantity of silica should be present, and limestone or other fluxes should not be used.

The deoxidizing agent is obtained as follows: When considerable slag has collected, it is electrically heated in the same or another furnace to a temperature exceeding 2500 deg. C. Coke or charcoal in quantities of 40 to 80 per cent. of the weight of the slag is added, preferably in a heated condition, reducing the slag to a product consisting of 20 to 30 per cent. iron, 40 to 60 per cent titanium, 20 to 25 per cent. carbon, with little or no silicon. This product is employed for reducing the titaniferous iron ore in the place of coke or coal heretofore used. The heat set free during the reaction on the iron ore, aids the smelting not only in regard to speed, but also as to the certainty of the desired result.

International - Amet Oil Gas Producer

A new gas producer, using oil as fuel and known as the International-Amet oil gas producer, has recently been placed on the market. It is claimed to give much greater economy than producers of other types. A number of operating tests have been observed in which 1 gallon of oil has produced 8 b.h.p. An engine working over a period of several months has averaged 6½ b.h.p. per gal. under variable conditions of load, temperature and oil from 14 to 22 gravity. These results were obtained on a plant of comparatively small size, viz., 100 h.p.

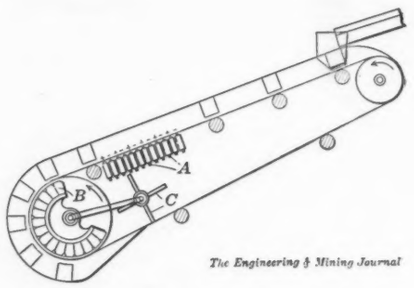
Among the advantages claimed are economy of space and simplicity of apparatus. Another advantage is that with this process in warm weather, or by artificially heating the oil in cold weather to 100 deg. F., a producer can be put into full operation in 1½ min. The apparatus for producing gas is of the simplest nature, consisting of a closed box-like combustion chamber, free of baffles or checker work. It is supplied with air by a blower of the positive type, requiring a pressure of no more than one pound to the square inch. The oil is introduced at the same pressure. The partial combustion ensuing therefrom is not a fierce blast, but a gentle flame which does not produce any damaging effect on the brick lining.

The gas is conducted from the combustion chamber through a brick-lined passage to a water seal communicating with the washer; and from the washer to the holder and engine. There is also a holder for equalizing the gas pressure and automatically regulating the rate of production of gas to meet the demand. The depreciation on a plant of this character is much less than that of a steam plant. The generator itself being made of cast iron, lined with brickwork, is subject to little wear and tear. The producer is manufactured by the Smith-Booth-Usher Company, of Los Angeles.

Magnetic Separator

In U. S. Pat. 945,408, Jan. 4, 1910, Sheldon Norton, of Mineville, N. Y., describes a magnetic separator for separating magnetic from nonmagnetic particles of iron ore.

Referring to the figure, which is a sectional elevation of the separator, the ore mixed with water is discharged from a spout on an inclined belt with magnets at *A* and *B*, the latter mounted in the lower drum. The belt by means of rollers is given a trough-shaped cross-section as it travels downward, but after passing the lower drum, it runs flat to the upper one, where it is troughed again by rollers. The magnets not only assist the magnetic particles to settle by gravity, but also retard their movements down the belt, while the water and nonmagnetic particles flow down freely. The magnetic particles are carried around by the magnets *B*, and when out of their influence fall from the belt by gravity, facilitated by a beater *C* with arms.



NORTON MAGNETIC SEPARATOR

Production of Abrasive Garnet

The entire production of abrasive garnet in the United States comes from the Adirondack mines in the State of New York. The production in 1909 was 3802 tons, valued at $121,700, as compared with an output of 2530 tons, worth $78,090 in 1908. The increase in production would have been fairly satisfactory if demand had increased at a corresponding rate. The mines, however, held in stock at the close of 1909 a considerable part of the output.

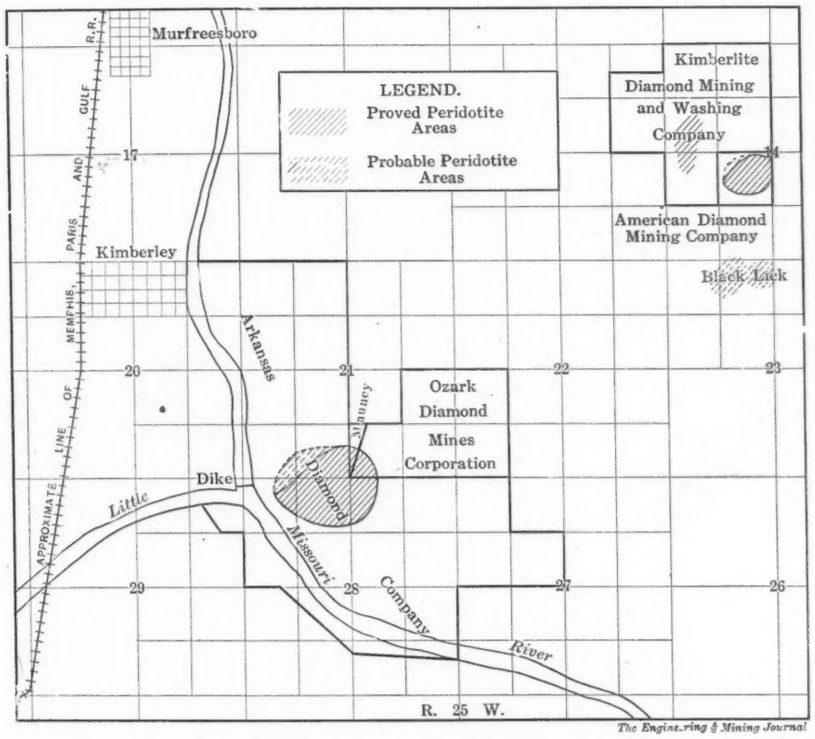
Correction

In reference to the article in the JOURNAL, of January 15, "Analysis of Mine and Mill Practice on Rand—I," Mr. Weston writes: "I find one or two mistakes due to my carelessness and bad writing. I meant to say most of the best amalgamations were *now* carried out, not *not* carried out. The dip of the City Deep reef is 38 deg., not 38 per cent."

The Arkansas Diamond Fields in 1909

BY JOHN T. FULLER.*

The progress of diamond mining in Arkansas during 1909 was slight, due principally to lack of capital for development, but it is expected that 1910 will show considerable progress toward the ultimate proof as to whether or not the field is a profitable venture. The total output from the entire field to date is approximately 1000 diamonds, or about 500 carats. The most important event of the year, from a general standpoint, was the extension of the Memphis, Paris & Gulf Railroad into Murfreesboro, thus giving direct rail communication to the field.



DIAMOND-BEARING AREAS, PIKE COUNTY, ARKANSAS

The existence of two peridotite pipes in this region has been determined. Both are in township 8 south, range 25 west, Pike county, Arkansas. One pipe is in sections 21 and 28, most of which is held by the Arkansas Diamond Company, M. M. Mauney and the Ozark Diamond Mines Corporation owning about 10 acres. The second pipe lies in section 14, and as far as determined is held by the American Diamond Mining Company. There is a possibility that this pipe extends into the land of the Kimberlite Diamond Mining and Washing Company, and that the yellow ground claimed by the latter company is a second exposure of the same pipe. The Black Lick and the dike on the Ozark property are still debatable and undetermined.

*Mining engineer, Murfreesboro, Ark.

FOUR COMPANIES INCORPORATED

There are at present in these fields four incorporated companies and two private holdings. The accompanying map shows the extent and relative position of these properties. The companies at present in the field are the Arkansas Diamond Company, Ozark Diamond Mines Corporation, American Diamond Mining Company, and Kimberlite Diamond Mining and Washing Company. The private holdings are those of M. M. Mauney and the Grayson & McCloud Lumber Company, at Black Lick. In February, 1909, the Kimberley Townsite and Land Company was formed, and a townsite laid out, which has since been incorporated as the town of Kimberley.

THE ARKANSAS DIAMOND COMPANY

A large number of prospecting pits have been put down on the property of the Arkansas Diamond Company, with the view of determining the hardness and extent of oxidation of the underlying peridotite. These pits also incidentally proved that the peridotite area extents farther to the west than was at first thought. When an accurate survey can be made it will probably be found that the volcanic area will prove in excess of the 60 acres originally estimated.

Early in August a small diamond-washing plant was erected for testing and experimental purposes. This plant consists of a revolving sizing screen, screening to five sizes, one 8-ft. rotary washing pan, and one Harz jig. A 20-h.p. portable boiler and engine supplies the motive power.

This plant was erected and operated solely for the purpose of determining the mechanical details and degree of concentration to be expected in a larger, permanent plant which is now under consideration. The new plant will be a direct double-treatment plant, capable of handling 1000 loads of 16 cu.ft. per day of 10 hours. It is hoped to have this plant ready for operation by January of next year.

About 800 diamonds have been recovered from this property, ranging in size from 1/16 to 6 carats. The blue-white stones are valued at $125 per carat in the rough and $400 per carat in the finished gem. About 25 of these stones of all grades have been cut and found to be of exceptional hardness, brilliancy and value.

OZARK DIAMOND MINES CORPORATION

Considerable prospecting work with a core drill has been carried out by this company on the eastern part of its ground. It is believed that the company has discovered a dike of peridotite lying 20 to 40 ft. below the surface and striking north and south, as indicated on the map. The bore holes indicate this dike to be about 100 ft. wide.

No work of any importance has been performed on the western area of this company, on which, as shown by the accompanying map, there are about 8 acres of the pipe worked by the Arkansas Diamond Company. This area was originally owned by M. M. Mauney, and sold by him during the year to the Ozark company. On these 8 acres and the two acres still held by Mr. Mauney, about 75 diamonds have been found without any systematic search or washing. One of the stones from this tract is a blue white of excellent quality. An 8-ft. rotary washing pan was purchased last June, but has not been erected.

OTHER COMPANIES AND INDIVIDUALS

The Kimberlite Diamond Mining and Washing Company has recently been incorporated, the land having been held during the last year as a trusteeship. The property lies to the east and north of the American Diamond Mining Company's

land. Several long trenches have been dug, and three or four prospecting shafts put down from 20 to 40 ft. in depth. The company claims to have exposed a large body of completely oxidized kimberlite or peridotite, but no finds of diamonds are reported to date.

But little work has been performed by Mr. Mauney on the 2-acre tract of the pipe still in his possession. A charge of 50c. admission is made to visitors, which entitles the person to search for diamonds and keep all he may find. Several diamonds have been found in this way, and it is reported that one $45 stone was picked up by a visitor.

There is a peridotite pipe on the property of the American Diamond Mining Company, of as yet undetermined extent. A number of test pits and bore holes have been put down, and several acres of surface soil removed, determining definitely the existence of a pipe. The recovery of 15 diamonds is reported. There is no work being done at present.

The Black Lick comprises about 40 acres, over which there has been considerable controversy. It has not yet been determined whether or not peridotite exists there. Owing to the fact that the surface soil is a rich black gumbo, similar to the soil overlying the first-discovered pipe, this area was jumped by a number of persons, and mineral claims were staked out and filed thereon. The Grayson-McCloud Lumber Company, to whom the tract belongs, brought suit against these persons and they were evicted by order of the court. No prospecting work worthy of the name has been performed and no diamonds found.

Discoveries of vanadium ore are reported by a British consul to have been made recently in the Cerro de Pasco mining district, Peru. The export of this mineral has so far been exclusively to the United States.

Storage-battery Locomotive for Use in Mines

By J. B. Van Brussel.*

A unique type of storage-battery locomotive, for which are claimed several marked advantages over those operated by overhead trolleys or third-rail conductors, is now in use in a large number of important German and Hungarian mines. These locomotives are thoroughly reliable, and without question less dangerous to the miners than the usual locomotives, as they eliminate the need of any exposed conductors. They also have a large sphere of action without extensive overhead construction.

The locomotives are equipped with motors of from 8- to 32-h.p. capacity; each locomotive is provided with two sets of batteries when uninterrupted service is required. The batteries are mounted on the top and are removable for charging. The gearing for this purpose is of special design, with permanent rolls fixed in the locomotive frames directly above the truck. By providing this equipment it is possible to shift the discharged batteries and replace them with fully charged sets with a minimum expenditure of time and labor. One storage battery is charged in the charging room, while the other is operating the locomotive in the mine.

Charging the Batteries

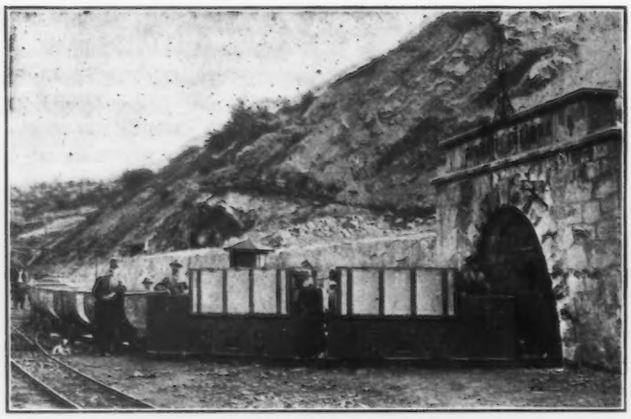
It is stated that the storage batteries used seldom discharge more than 60 or 70 per cent. of their capacity, and it requires, for charging, only about ⅓ of the time usually taken for discharging when in operation. Partially discharged batteries may be fully charged in about 1½ hours.

The mining locomotive of this type of 20-h.p. capacity has two batteries of 90 cells each, the capacity of each cell being 74 ampere hours. They are capable of operating 400 effective ton-kilometers on a single charge.

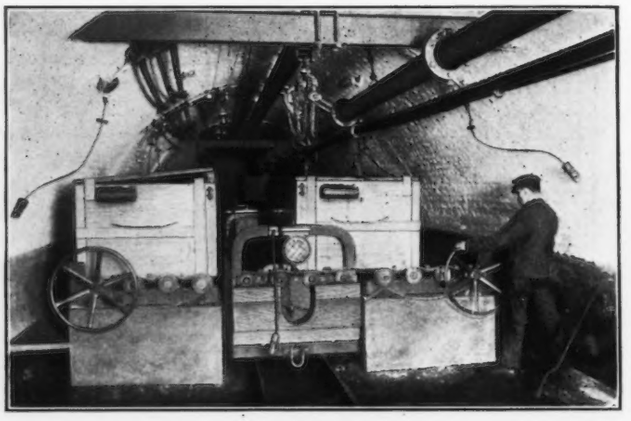
The cost of operation is from ⅓ to ½ the cost of animal power, it is claimed, and the current required is from ¼ to ⅓ kilowatt-hour per ton-kilometer. A further advantage of these equipments over the trolley and third-rail mining locomotive is that no added weight is needed for adhesion, as the storage battery provides all the necessary weight required.

Five of these storage-battery locomotives are in use at the Konigsborn mines, near Heesen, in Westphalia (Germany). Eight storage batteries are provided, each having 81 cells of a capacity of 74 ampere hours. In the Hungarian Petroseny mines, there are 8 battery locomotives in operation. These locomotives are working in pairs. The double units thus formed are capable of hauling 40 coal cars without difficulty. At these mines there are used 16 sets of batteries, of the Tudor type. Each locomotive has 51 cells, with a capacity of 74 ampere-hours each.

*Brussels, Belgium.



Double-unit Storage Battery, 24 Horsepower, in Operation, Petroseny Mines, Hungary



A Discharged Battery Being Removed for Charging. Charged Battery at Left

Victoria Copper Mining Company

The Victoria Copper Mining Company, of Michigan, operated at a loss of $32,090 in the year ended Dec. 31, 1909. The production was 1,062,218 lb. of copper. For the last three months the cost per ton of rock stamped was $1.07, stamping 521 tons per day. The yield of copper was only 10.2 lb. per ton, and its total cost was 13.67c. per lb. There were 118,605 tons of rock stamped during the year. A large amount of diamond drilling was done and a good core taken from hole No. 17, 4514 ft. east of the working shaft, indicating a lode 17 ft. wide. An incline shaft is being sunk to open this ground. The company is figuring on the development of an extensive water power to supply power to nearby mines.

Copper Deposits of the Globe-Kelvin Districts—I

Near Miami Disseminated Orebodies in the Pinal Shists Are Being Extensively Developed by Miami, Inspiration, Keystone, Cordova and Others

BY EDWIN HIGGINS*

With enormous overbodies developed, exploration work proceeding on a substantial scale, concentrators in course of erection, and needed railway projects under serious consideration, the Globe and Kelvin districts of Arizona bid fair to become two of the most important copper producers of the Southwest. Although special reference is here made to the disseminated deposits in the vicinity of Miami and Ray, there are other classes of copper deposits within a radius of 15 miles of the Pinal mountains that are of great importance. For many years the Globe district has been well known, first as a silver and later as a copper producer. During these years, operations were conducted in the lode deposits, replacement masses in limestone and irregular mineralizations of shattered or permeable rocks, and it was not until ore was encountered on the Miami property, in January, 1907, that serious attention was given to the disseminated deposits. This discovery came near not being made, for operations were about to be discontinued; it is said that the superintendent on the ground continued work in the shaft after orders came to stop, with the result that ore was encountered within a few feet more.

Globe is situated to the northeast of the Pinals, in Gila county. It is on the Gila Valley, Globe & Northern Railway. For a long time Globe was the terminal point of this railroad, but recently it has been extended to Miami to secure the traffic originating with the mines and prospects in this vicinity. The Gila Valley, Globe & Northern Railway is a subsidiary of the Southern Pacific and connects with the main line of this system at Bowie. From the north Globe is at present inaccessible, except by wagon road.

Kelvin may be reached from Globe by a stage trip of 39 miles; by the railroad it is necessary to make a roundabout trip, covering almost two days. Conditions will be greatly improved when the Phœnix & Eastern Railway extends its road from Winkelman to San Carlos. Work on this extension has been in abeyance for some months, owing to trouble in securing a right-of-way for a short distance, but it is thought that this will soon be arranged and construction work again started.

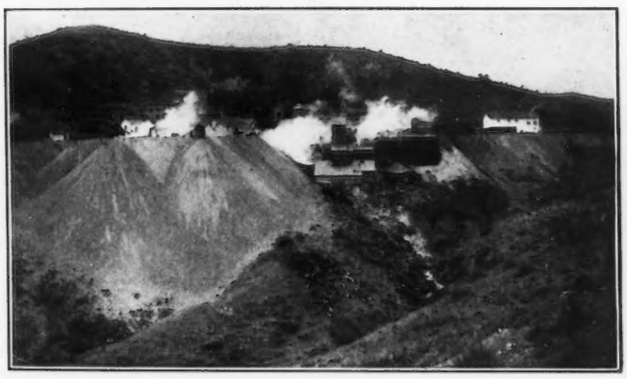
Geology

Much has appeared recently in the technical press regarding the geology of the Globe district. Through these articles, but primarily through the accurate and exhaustive work of F. L. Ransome, results of which were published by the U. S. Geological Survey in 1902, this subject has received wide publicity. Up to the early part of 1907, however, practically nothing was known regarding the disseminated copper deposits.

According to Ransome, the Pinal schists, of pre-Cambrian age, are the oldest rocks of the district. These represent ancient sediments which, prior to the deposition of the lowest Cambrian rocks known in this region, were upturned and compressed, intruded by granitic rocks, and metamorphosed to their present crystalline condition. A long period of denudation and degradation reduced this crystalline basement to a fairly even surface, or peneplain, upon which the next younger rocks were deposited. These comprise shales, conglomerates and quartzites, of a total thickness of from 500 to 800 ft. These rocks are thought to be of Cambrian age and are referred to the Apache group. Overlying the Apache group is a series of fossiliferous limestones ranging in age from Devonian to Pennsylvanian. These have an observed maximum thickness of about 400 ft. and are referred to as the Globe limestone. It is probable that an erosion interval separates the Globe limestone from the Apache group. The original top of the Globe limestone, which closes the record of marine sedimentation, is nowhere preserved in the district.

During the long interval between the close of the Pennsylvania and the extensive effusive eruptions of dacite, which are provisionally referred to the early Tertiary, occurred the second great deformation of the region, imposing upon it structures to which are in large measure due the features of the present topography. The Paleozoic sediments and their underlying crystalline basement were cut by hundreds of faults. Following or accompanying the faulting, large masses of diabase were intruded, chiefly in the form of sills, between the sedimentary beds of the fault blocks. Long-continued erosion followed the intrusion of diabase, during which the rocks were further faulted and the original sulphide ores were deposited.

Following this period of erosion were extensive eruptions of dacite which appears to have covered all of the region with the exception of the higher portions of the Pinal mountains. The time of the volcanic eruption may be tenta-



No. 1 Shaft and Experimental Mill of Miami Copper Company

Looking South from Cordova's Sullivan Shaft

*Consulting mining engineer, Columbia Trust building, Los Angeles, Cal.

tively referred to the Tertiary, but the region affords no known facts upon which to base a more precise date. After the dacite eruption the region was again deformed by extensive normal faulting. The rocks, traversed by numerous faults, were carved into nearly their present topography, and the waste was deposited in the valleys as a variable fluviatile accumulation which has been termed the Gila conglomerate. The age of this conglomerate is probably early Pleistocene or possibly late Tertiary. During its deposition there was at least one eruption of basalt. Faults also occur in the Gila conglomerate.

Pinal Schists

Ransome describes the Pinal schist as generally light gray in color, with frequently a silvery, satiny luster. In texture it ranges from cryptocrystalline, slaty sericite-schists, through finely granular, fissile rocks of somewhat sugary texture, to imperfectly cleavable, highly crystalline muscovite-schists. The sericite-schists, with their regular cleavage and inconspicuous crystallization, are characteristic of the larger schist areas at some distance from the Madera diorite contact. The coarser, more conspicuously crystalline muscovite-schists are found near the contact and in masses of schist inclosed by the granitic rock.

The Pinal schist has a prevailing nearly vertical schistose structure, probably in the main parallel to original bedding planes. It is intruded by granitic rocks, and both schist and intrusive masses were degraded to a peneplain before the deposition of the Apache group upon the complex basement thus provided. The preponderance of quartz over all other mineral constituents, the still greater preponderance of quartz and muscovite together and the general absence of calcic minerals are strongly indicative of the formation of the Pinal schists by metamorphism from quartzose sediments.

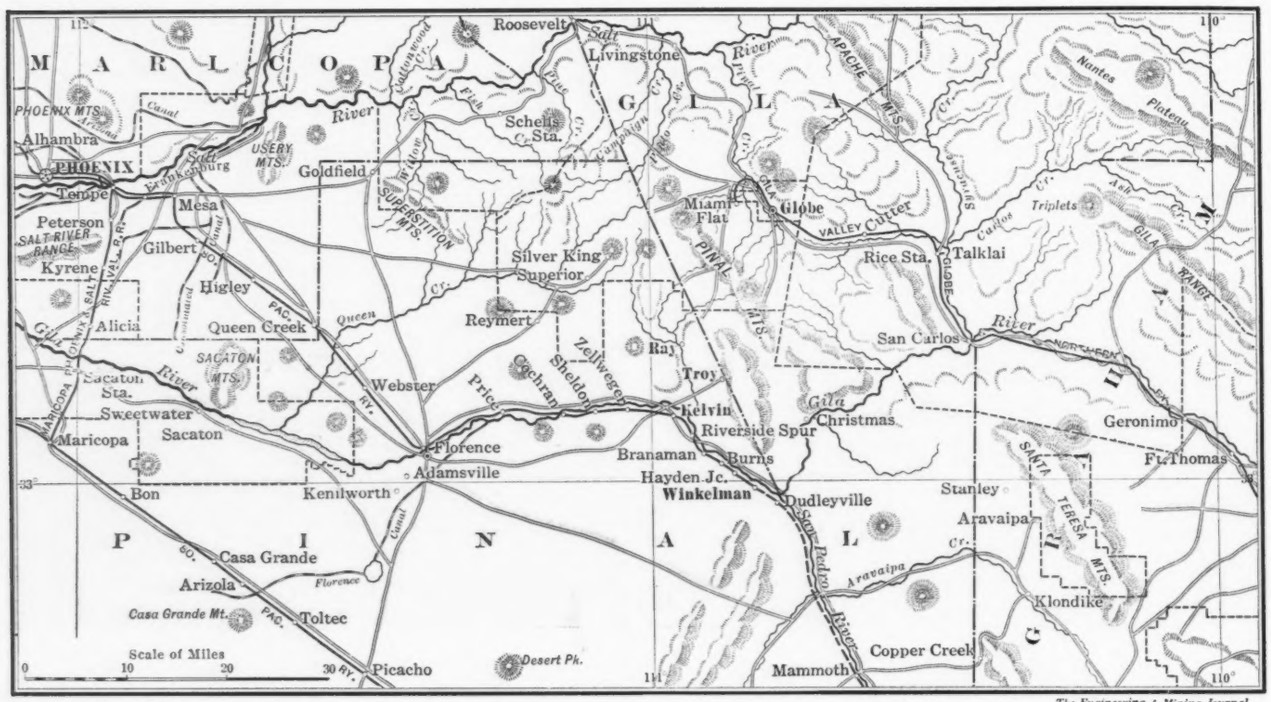
The Disseminated Deposits

The orebodies so far developed to the west of Miami flat consist of small bands and disseminations of chalcocite in the Pinal (sericite) schist. Roughly, this zone may be said to extend along the contact of the schist with the Schultze granite, from the Black Warrior through the Miami and Inspiration groups; passing on through the Keystone and Live Oak the mineralization is found extending into the granite near the contact. The outcropping schist has been weathered and leached to depths ranging from 50 to 200 ft. or more; it is iron stained in places—in others, copper stained. Downward-percolating surface waters, charged with the copper once contained in the eroded surface and the present leached zone, have enriched the cupriferous pyrite of the primary deposition, thus forming a commercial orebody containing from 2 to 5 per cent. copper. An accompanying sketch map shows the location of the principal groups of claims in this district and gives some idea of its geology. The sketch was made by permission from a copyrighted map, by Sultan & Wayne, engineers, Globe; the geology, which is approximately correct, was sketched in from data obtained elsewhere.

Development and Characteristics of the Miami Orebody

The property of the Miami Copper Company was taken under option by the General Development Company and work begun in January, 1907. In April of the same year ore carrying 3 per cent. copper was encountered at a depth of 220 ft. in the Red Rock (No. 1) shaft. By the month of June a depth of 270 ft. had been attained and ore was opened up for about 50 ft. square. The shaft was then continued down to the 720-ft. level and work started on the 370, 470 and 570. In March, 1908, it was figured that there were 2,000,000 tons of ore developed, and in January, 1909, the estimates showed 13,315,000 tons available. Since that time little attempt has been made to increase the tonnage of ore developed, the aim having been to block out more thoroughly the orebody already developed. Recently, however, three Star churn drills have been put to work prospecting some of the virgin ground.

On the 270 level development work has outlined an orebody approximately 270 ft. east and west by 180 ft. north and south; also a small body 250 ft. further north, 200 by 60 ft. The workings on this level cover approximately 1⅓ acres and the ore averages 3.2 per cent. copper. The extreme top of the orebody is 200 ft. below the collar of No. 1 shaft. Near its top the orebody is entirely surrounded by leached ground, the dividing line be-



The Engineering & Mining Journal

Country Around Globe and Kelvin, Ariz., with Parts of Gila, Maricopa, Pinal and Graham Counties

ing well marked. As depth is attained the leached ground continues on the northeast, east, southeast and south, the line of demarcation between the ore and leached ground being distinct and marked by slips and fault planes. The change from practically barren rock to ore occurs within a few inches.

The west side of the orebody, from the 270 to the 570, as far as explored, is bounded by an oxidized zone carrying silicates and carbonates, the silicates predominating. This oxidized zone has not been explored to a great extent, but it is not believed to be of great width, for sulphides have been developed beyond in No. 3 shaft. To the southeast, beyond the leached ground, work on the 470 and 570 has extended into the Gila conglomerate. On these two levels the width of the leached ground is from 10 to 40 feet.

On the 370 the orebody is divided into two parts by a horse of leached and partially oxidized rock projecting down from the capping. Including the leached ground, the size of the orebody on this level is 700 ft. east and west by 800 ft. north and south. This includes approximately 12 acres in ore, averaging 2.96 per cent. copper, and 2 acres in leached and oxidized ground.

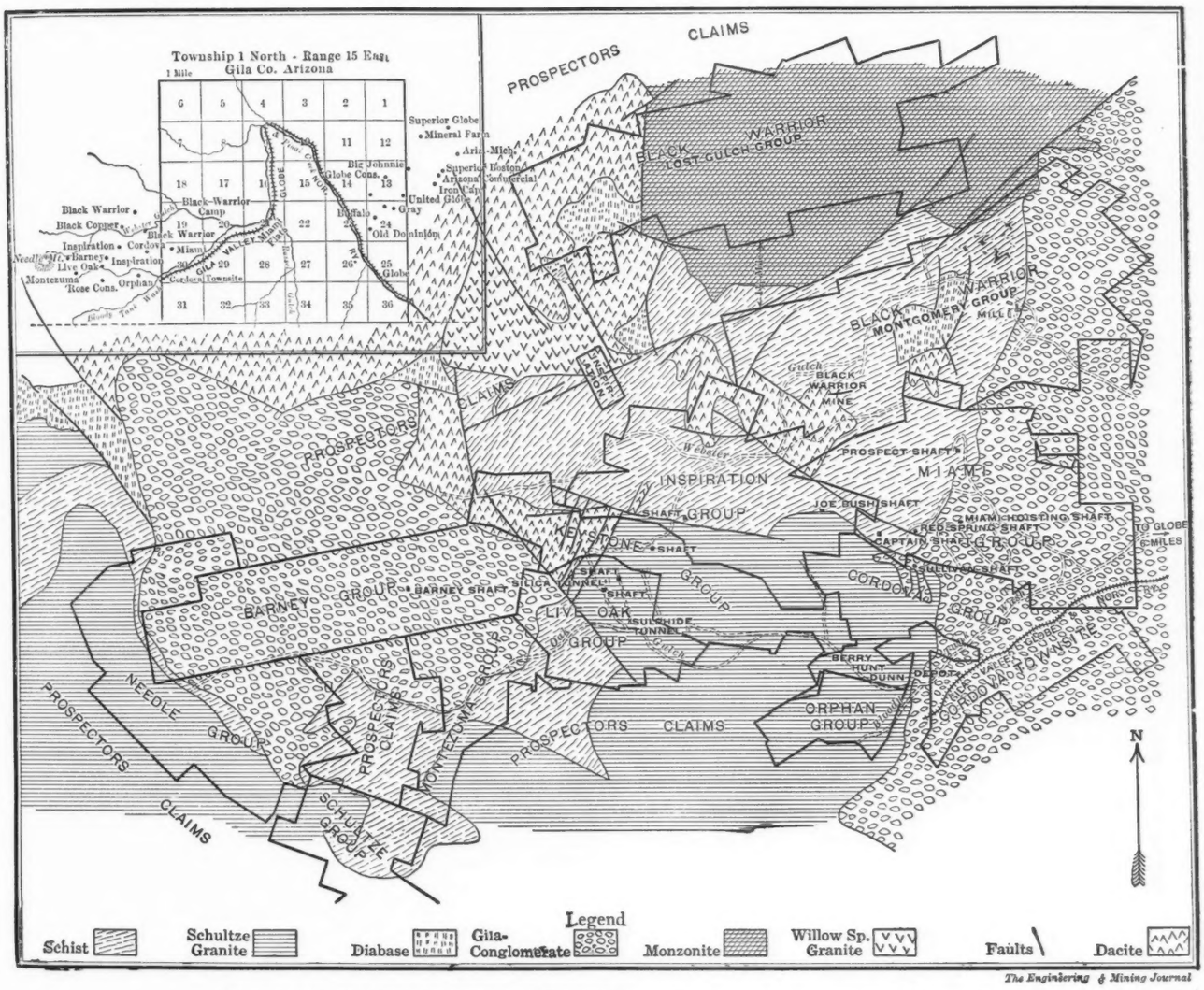
On the 470 level the orebody is 700 ft. east and west by 1300 ft. north and south, and shows approximately 16 acres of ore averaging 2.76 per cent. copper. When this level is fully developed it will probably show 20 acres of ore. The 570 level has not been as fully developed as the 470, but sufficient work has been done to determine that it contains at least as much ore as the 470. The ore on this level averages 2.65 per cent. copper. From the above it may be seen that the orebody increases in size with depth, at the same time decreasing slightly in copper content. It is probable that no ore carrying less than 2 per cent. copper will be mined, except under favorable conditions.

Although the orebody has no regular strike and dip, the Pinal schists carrying the ore strike north 26 deg. east and dip from 50 to 55 deg. southeasterly. Nowhere is the division between the sulphide and oxidized ore as sharp as between the leached ground and the orebody.

Development Work at Miami Property

Work at the Miami property is being directed toward the development of the orebody, prospecting with three Star churn drills, sinking the future working shaft (No. 4) below the 420 level and the construction of a concentrator. Development work is proceeding from No. 1 shaft. The orebody is being blocked out in rectangles preparatory to mining on a large scale; the method of mining will be described in a later article. Early in January, 1910, there were 700 men on the payroll. Of these 100 were working underground and 30 on surface work directly connected with mining; the total number having to do with mining management was 200. On mill work there were 400 men.

In underground development, from 3000 to 3500 ft. of ground was being broken per month; this yielded from 450 to 500 tons of ore per day. In this work the

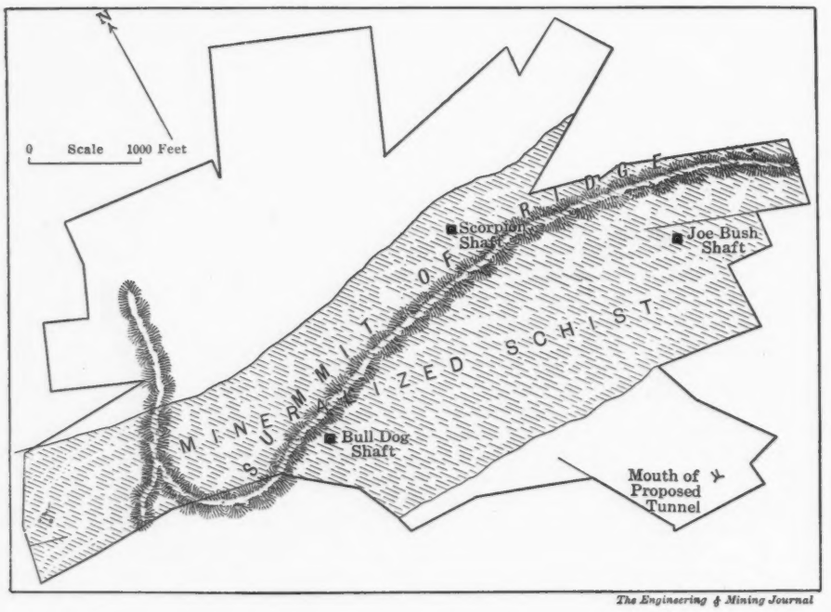


GEOLOGICAL MAP OF THE MIAMI SECTION OF THE GLOBE MINING DISTRICT, ARIZONA

costs were approximately as follows: Miners, $1.25 per foot; trackmen and trammers, $1.25; powder, caps, fuse, candles, $0.90; total, $3.40 per foot. Reckoning 3.5 tons to the foot, gives $0.9714 as the cost of delivering a ton of ore to the shaft for hoisting. Hoisting under present conditions probably costs 50c. per ton, so that the cost of delivering ore on top, during development, is in the neighborhood of $1.50 per ton. The ore dump, shown in an accompanying illustration, contains more than 150,000 tons of ore of various grades, the average probably being about 2.75 per cent. copper.

Inspiration Copper Company

The property of the Inspiration Copper Company adjoins the Miami on the west.



Inspiration Property in the Miami Section of the Globe District

An accompanying illustration shows more closely the area of mineralized schist. This is thickest to the south of the ridge, gradually thinning out to the north. The overburden, or capping, here varies from 50 to 350 ft., so that a great deal of the ore may be mined by stripping and milling.

The Inspiration Company began work in January, 1909, since which time the Bull Dog shaft has been sunk 300 ft., the Joe Bush 425 ft. and the Scorpion 300 ft. Work was started on the 300 level of the Bull Dog shaft, when a fault was encountered and work stopped. The development of the Woodson orebody from this shaft will be deferred until a compressor plant is installed. In the Joe Bush shaft, ore was encountered 95 ft. below the collar; the orebody has been proved to be 325 ft. thick here. I learned little regarding the exact value of the ore on this property, but from a reliable source I understand that it is of comparatively high grade. The ore in the bottom of the Joe Bush shaft is said to carry more than 3 per cent. copper. On the 400 level there is more than 800 ft. of development and several headings are being driven. Not much work is progressing in the Scorpion shaft. A station has been cut at the 275 level preparatory to the exploration of the orebody through which the shaft passed last summer. Work is also being carried on in the Mercer tunnel and in the Taylor tunnel.

As indicated on the accompanying sketch, a tunnel will be driven to get under the ore developed from the Joe Bush shaft. Eventually a shaft will be sunk in the vicinity of the portal of this tunnel to catch the ore beneath the tunnel level. The elevation at the collar of the Joe Bush shaft is 3841 ft.; that of the tunnel level, 3650 ft. This tunnel, which will be driven over 3000 ft., had just been started at the time of my visit.

Only a small proportion of the Inspiration ground has been drilled, although work is now progressing with two Star churn drills. Although the Inspiration property has been developed much less extensively than the Miami, work up to the present has been quite satisfactory, and there can be little doubt but that Inspiration will eventually make one of the important producers of the district.

Other Properties

In addition to Miami and Inspiration, the Warrior, Live Oak and Cordova properties also are in operation. On the Live Oak work is progressing in a 1200-ft. tunnel and in a 350-ft. shaft. Work is being done in two shafts, one of which is about 650 ft. deep, on the Cordova property. The Black Warrior is just beginning to prospect with churn drills. Previously this company had been working on an orebody of chrysocolla from which it shipped no ore carrying less than 8 per cent. copper.

The Keystone is operated by the Lewisohns. This property has one shaft down 350 ft. and has been partially prospected by churn drills. There are other developments in the district, of which I took no notes.

(To be continued)

Salt Monopoly of Venezuela

The government of Venezuela, according to a recent consular report, has signed a contract with the Compañia de Navegacion Fluvial y Costanera de Venezuela by which that company secures a lease of the salt monopoly for a period of two years, with the privilege of two years' extension. This gives the company possession of all the present salt works and all the salt deposits of the country. It virtually concedes to the company, in addition, a monopoly of the coastwise salt transportation during the period mentioned.

The company will pay the government a rental of $820,250 for the first year, $868,500 for the second year, $916,750 for the third year, and $965,000 for the fourth year, payable monthly.

The importation and industrial manufacture of salt except by the company is prohibited, and even the company is prohibited from introducing foreign salt into the country. The contractors agree to dispose of salt at the various salt works or deposits, numbering 14, at prices ranging from 5.75c. to 8.10c. per 2.2 lb. The company must sell salt to fishermen at 1.93c. per 2.2 pound.

The contractors agree to maintain enough salt in stock to prevent fluctuations from the above prices under penalty of $1000.

The contractors are free from all imposts, duties, etc., on the properties or on machinery, utensils, etc., which they may introduce, and are authorized to construct Dacoville railways in the salt works if they consider it worth while, and the government will pay 40 per cent. of the cost.

The contractors agree to give a bond to the government before entering into possession of the salt works in the amount of $96,000. They also agree to limit the sales for the last four months of their contract to 2,000,000 kg. (1 kg. = 2.2 lb.) per month, not to sublet the whole or any part of the salt works, and to submit every question arising as to this contract to the Venezuelan courts, and not to apply to any other government for diplomatic intervention. It is understood that it is the intent of the lessees of the salt concession to increase the output greatly so as to provide for the exportation of large quantities.

Smelting Bismuth-Lead Ore, Sinaloa, Mexico

Campaign Indicated That Charge Should Contain 10 Per Cent. Lead and 2 Per Cent. Bismuth. Recovery of Bismuth 80 to 90 Per Cent.

BY S. E. BRETHERTON*

At the Bismuth King mine near Rey del Bismuto in Sinaloa, Mex., I made a test run for the recovery of bismuth, gold, and silver. The company had a small blast furnace 30x60 in. at the tuyeres, and 14 ft. 10 in. deep, top of crucible to feed floor, with the ordinary lead crucible. Several smelting campaigns had been made previously, producing fairly clean slag. Not having kept accurate records of ore smelted, the losses were not known, but must have been considerable, as no forehearth or settler had been used to catch what little matte, speiss or bullion that is usually carried over with the slag mechanically, especially when rodding the furnace. They had used an extra large slag pot which was little better than nothing; with an intermittent slag tap, the slag rushes through a small receptacle so fast that there is no time for the matte or speiss to settle. The ore was mostly oxidized and litharge was used for the lead supply, so that no large amount of matte had been made.

When I arrived on the ground, ore, limestone and coke were already delivered, and a limited supply of lead ore, containing 18 per cent. sulphur, and 8 to 10 per cent. zinc. This meant a large matte fall in the blast furnace. To save time I cut up an old abandoned boiler and made two excellent matte settlers from the shell. While these were being made, I had my assistant contract for some of the local hardwood, to be delivered green, as I wished to use it in the blast furnace to save coke.

I started the blast furnace with inexperienced Mexican labor which did excellent work, as the following results will show: The furnace was in blast only 26 days, and at the end of that time there was no incrustation on the walls of the furnace, or in the crucible, nor had any fire shown at the feed doors during the run. I had several shut downs of a few hours each on account of the machinery.

Character of Ore

I think it best to describe local conditions so that the results will be more thoroughly understood and appreciated, especially as bismuth is considered more difficult to recover than lead. The ore contained: Bismuth, 2 per cent.; iron, 33; silica, 31; alumina, 12.5; magnesia, 2; zinc, 1; copper, 9, and a trace of lime, arsenic and sulphur. The gold and silver contents are omitted as they do not enter into the slag formation of the ore. The principal value is gold. The bismuth and lead assays were made by the wet method, and not the commercial or dry assay which is 2 per cent. less.

For lead ore there was a limited supply of sulphides, rich in silver and containing: Lead, 50.7 per cent.; copper, 1.4; zince, 8.4; sulphur, 18; iron, 6; silica, 11, and alumina, 1; with sufficient lead bullion containing no bismuth and some silver, made from old litharge to nearly fill the crucible of the blast furnace.

At first I started with 9.75 per cent. lead and 1 per cent. bismuth in the charge, and soon had the bullion up to its proper proportion of bismuth contents. The slag averaged 1.1 oz. silver and 1.2 per cent. lead. There was too little gold and bismuth in the slag for the chemist to determine, so that an excellent recovery of the metals, bismuth included, was being obtained. In order to curtail the lead ore and make the bullion richer in bismuth and gold, I reduced the amount of lead ore in the charge one-half, and fed the bullion back to the furnace, until it assayed over 17 per cent. bismuth. I also fed back some matte, thinking that by using less lead ore containing sulphur, I could perhaps enrich the matte by resmelting. The matte made after this did contain more copper, thus showing a concentration of the matte.

About this time I discovered that the bismuth losses were very high, due no doubt to insufficient lead in the charge, as the lead from the bullion fed back could only melt and drop through the furnace and not mix properly with the charge, as a collector. I then took stock of the bullion in the crucible and furnace, and increased the percentage of lead in the charge for a few days, and as close as I could estimate, found that the recovery was 91 per cent. of the bismuth. It was then necessary to reduce the amount of lead in the charge in order to continue the run a few days longer with the supply of lead on hand.

Cupelling the Bullion

As soon as it was learned how the bismuth losses increased as the lead in the charge was decreased, the management decided to shut down and put in a cupel furnace, which I had suggested originally. Cupelling the bullion has the following advantages, especially when smelting so far from a railroad and the markets:

(1) Freight and treatment saved by shipping a richer and smaller amount of bullion.

(2) Less burden to be smelted in the charge to get the necessary lead. Litharge averages over 90 per cent.

(3) Litharge is easily crushed fine to mix through the charge to collect the precious metals, remaining with the charge better than metallic lead, as it does not melt so quickly and with ore containing arsenic or sulphur, the oxygen in the litharge has a beneficial effect.

(4) It enables the metallurgist to carry more lead in the charge and make cleaner slag where the lead ore is limited, or the ore contains enough lead to interfere with other methods of treatment, but not enough to gather the metals properly in the blast furnace.

The loss of lead is necessarily greater by cupelling and resmelting, and it is necessary to have sufficient lead in the original ore mixture to supply these losses, and some lead to be left with the precious metals in order to ship them by freight instead of express. The value of the extra lead lost by resmelting is scarcely worth considering, when taking into account wagon freight, railroad freight, and refining charges.

The question which naturally occurs when it comes to blast-furnace smelting for the recovery of bismuth is: Can the lead be cupelled from the bismuth as well as from the gold and silver? For reply I quote Hofman's Metallurgy of Lead, page 507, as follows:

"Bismuth is concentrated with silver in the lead until toward the end of the process, and then greatly retards the progress of the work. It is finally oxidized and enters the litharge giving this a greenish color, and is absorbed by the hearth material, while the silver also retains some bismuth with great tenacity. If this bismuth is to be recovered, the silver is concentrated only to a certain degree (say to 50 or 60 per cent.) in the lead which is then cupelled in a separate furnace . . . "

To satisfy himself my assistant at the Rey del Bismuto made some experiments in the assay furnace with small cupels; on the strength of this statement and test, and my experience with a large cupel furnace in Leadville, Colo., and recently at Lodi, Nev., where I had erected a 7- to 8-ton, daily capacity, cupel furnace of an improved design, it was decided to put in a cupel furnace to assist in the recovery of bismuth at Rey del Bismuto. As a precautionary measure

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I advised the construction of a dust chamber and small baghouse, suitable for such a small blast furnace and cupel furnace. It will require considerable cooling of the cupel-furnace fumes before they can enter the baghouse. But with careful feeding of the blast furnace, the fumes can pass into the baghouse as soon as they pass through an ordinary dust chamber, to catch the bulk of the dust carried over mechanically.

Distribution of Bismuth in Furnace Products

Again referring to the bismuth and its distribution in the blast-furnace product, I found that it does not go into the matte as much as the lead, but it does pass off in the flue dust in greater proportion. For example, the bullion shipped contained 8.3 parts lead to 1.7 parts bismuth, while the flue dust only carried five parts lead to one bismuth and the matte contained 18.3 parts lead to one part bismuth. The proportion of bismuth to lead in the slag is uncertain. The slag averaged about 1 per cent. lead, the chemist often not finding more than a trace by the fire essay. His results when I suggested the use of a silver button in the crucible as a collector, when making a fire assay for lead, were no higher. A wet determination for lead on a mixture of all the daily slag pulps, was started but not completed when I left, the acid supply having run short. I think the ratio is about one part bismuth to 10 parts lead in the slag, although the chemist claimed at the start, when we were using more lead on the charge, that it was impossible to determine the bismuth in the slag, even when taking 20 grams of the pulp and using the wet method for assay.

Bismuth Recovery

In conclusion I think it is safe to say that 80 per cent. of the bismuth contained in a 2 per cent. ore (assay made by all wet method), and all the bismuth found by the combination fire and wet assay, can be recovered by lead smelting in the blast furnace, by using not less than 10 per cent. lead in the charge, and in connection with a suitable dust chamber and baghouse. Less bismuth in the ore would call for a smaller per cent. of recovery. A higher per cent. of recovery of the bismuth will result when the ore contains more than 2 per cent. bismuth. The chemist told me that the combination method of making a bismuth assay (a fire assay by using excess lead as a collector and then dissolving the button for bismuth) averaged about 81 per cent. of the bismuth found, by using all wet method. I consider that the blast furnace, under favorable conditions, will do equally as well as the combination method assay for bismuth. The recovery of gold and silver, as shown by the assays, was all the ore contained, in fact the gold showed a gain, and in Nevada where I cupelled the bullion and used the lead over again, the recovery of gold and silver was equally good. Little has been written on the metallurgy of bismuth. The acid process which I understand is being used in Australia for the recovery of bismuth is too expensive and not suitable for the ore of the Bismuth King mine.

Green Wood vs. Coke

I will relate another experience I had which might be of interest to readers of the Journal, that is, the use of wood already referred to. This wood was used to replace coke in the blast furnace, using 1½ lb. of wood to 1 lb. of coke. The advantage and economy in doing so is self-evident, when coke costs over $30 gold per ton and wood $1.25 per ton. Green wood weighs more than two tons to the cord. This had to be cut into short blocks and fed with the coke. I did not attempt to use anything but green wood, as there would be some danger of over fire, if dry wood had been used. I used wood 23 days out of the 25 days' run, with no apparent difference in the action of the furnace, either at the feed door or in the crucible. The average coke used for the entire run was 10.2 per cent. on ore and limestone, which would be less had we included the weight of new slag and matte resmelted.

The normal per cent. of coke for lead smelting, 15 to 16 per cent., was used for several days, but reduced the average to 10.2 per cent. by replacing nearly half of the coke with wood. This experience added to the experience I had at Ingot, Shasta county, Cal., when using small, green oak to save coke in a copper-matting furnace, during bad wagon roads or the wet season, leads me to believe that good green hardwood, aided with hot blast, would enable the metallurgist to get along without coke, where such wood can be obtained in sufficient quantities for a small smeltery for the production of copper matte. The success with wood at the Rey del Bismuto was in a great measure due to the way I had the feeders put in the charges, and the able assistance rendered by my assistant, W. W. Clayton, in seeing that the foremen and feeders carried out my instructions.

A New Use for the Low-pressure Turbine

The Mirrless Watson Company, of Glasgow, Scotland, has recently installed an exhaust-steam-turbine system at the works of Nobel's Explosives Company, at Stevenston, Scotland. The turbine takes steam at 1 lb. above atmosphere and exhausts to a condenser. Arrangements are made for the introduction of live steam to the turbine in case the exhaust supply becomes deficient.

Reciprocating engines will work at a comparatively high efficiency between the range of ordinary boiler pressures and atmospheric pressure, but they are inefficient in utilizing the available energy below atmospheric pressure. A steam turbine is, on the other hand, particularly suitable for utilizing efficiently the steam energy at the lower range of pressure, and its efficiency increases as the final pressure is decreased, or as the vacuum is increased. Thus, the more efficient combination is, no doubt, a reciprocating engine exhausting into a low-pressure turbine.

During the official tests of the condensing plant, the high-pressure steam connection to turbine was blanked off, the steam supplied to the engines was at the rate of 15,075 lb. per hour, and was exhausted to the turbine at a vacuum of 5 in., the turbine exhausting to condenser at a vacuum of 26.8 in. The engines developed 451 kw. and the turbine 326 kw., the auxiliaries consuming 38 kw., giving a net gain of 288 kw., or 63.85 per cent.

The Definition of Industrial Terms

At the recent annual meeting in Boston of the Division of Industrial Chemists and Chemical Engineers of the American Chemical Society, a committee was appointed by the chairman, under authority of the by-laws, "On the Definition of Industrial Terms." In constituting this committee, it is the desire of the division that it coöperate as far as possible with trade organizations in the several lines of industry in formulating definitions of their products which shall be as accurate and as fair as possible to the interests involved. The organization of such a committee was suggested by various interests who desire a more authoritative definition of some industrial terms such as "petroleum ether," "gasolene," "benzol," "bronze," "benzine," "steel," "portland cement," etc. It is proposed, when an interest is expressed for the definition of terms in any special field of industry to organize a sub-committee to consider this field and define the principal terms in use in it.

The general committee is desirous of receiving suggestions from all who are interested in the subject as to terms which are considered the most important to be defined at the present time, owing to ambiguities which may now exist, and as to the best methods of accomplishing the work. The value of authoritative definitions as approved by the industrial division of the American Society will, of course, be recognized. Communications should be addressed to Clifford Richardson, chairman of the committee, at 30 Church street, New York. The other members are J. B. F. Herreshoff and George P. Adamson.

The Zinc Deposits of Mohave County, Arizona

SPECIAL CORRESPONDENCE

The zinc region of Mohave county, Arizona, is about 6 miles wide by 12 miles long, in the Cerbat range, from 10 to 22 miles north of Kingman. The mines in which zinc is known to exist in paying quantities are the Golconda, Tub and Blackfoot in Union basin; the Idaho and Champion at Cerbat; the De La Fountaine, Star Spangled Banner, and C. O. D. on Stockton hill; the Keystone at Mineral Park; and the Pinkham, Midnight and Tennesee at Chloride. These properties were worked for gold, silver and lead, the zinc generally being considered as a detriment. There are many other properties that will show good zinc contents, if explored with that end in view.

F. C. Schrader, of the U. S. Geological Survey, describes the mineral bearing portion of the Cerbat range as follows: "The rocks are the pre-Cambrian complex, consisting of gray granite, gneissoid granite, and dark schists, including horneblende, mica, and garnet schists. They are flanked on the west in the Cerbat district by local areas of rhyolite and other Tertiary volcanic rocks. To the north, through Mineral park and toward Chloride, they are intruded by granite masses. They are locally cut by dikes of pegmatite, aplitic granite, diabase, vogesite, kerstantite, minette, and rhyolite. The deposits occur in well defined fissure veins, of which there are two sets, one striking about north 20 deg. west, and the other north 70 deg. west, usually with steep dips. Some of the deposits are also intimately associated with the vogesite, minette, and aplitic dikes."

EARLY SHIPMENTS

The first ore shipped for its zinc contents was over 10 years ago, when Byron Collins shipped a car of zinc ore from the Blackfoot mine to the smeltery at Cañon City, Colo. This was not a commercial success. In June, 1907, another shipment was made from Blackfoot to Cañon City, by a Canadian syndicate. This car ran about 48 per cent. zinc, and also contained gold and silver, and should have paid, as zinc commanded a high price, but owing to working conditions at the mine, did not do so. In 1907 a Blake-Morscher separator was placed in the Tennesee mill for working the large tailings dump accumulated when that mine was worked for its lead contents, and a magnetic separator was erected to treat the ore of the Idaho mine at Cerbat. Both were successful in separating the pyrite from the zinc, and made what would at present prices be good marketable material. They were just reaching the producing stage in December, 1907, when the slump in zinc prices forced them to discontinue.

GOLCONDA MINE

The Union Basin Mining Company, in March, 1908, secured control of the Golconda mine, which had been worked 20 years prior, for gold, silver and lead in the oxidized zone. Development has shown that this is the same ore as found below, with the zinc practically all leached out. The leaching process has stopped at approximately 70 ft., which may be taken as the water level, though no water in quantity is encountered until a depth of 300 ft. is reached. Below the water level, the ore assays about as follows: Zn, 47 per cent.; Fe, 7; Pb, 1; CaO, 0.40; SiO_2, 14; S, 28; Au, 0.20 oz.; and Ag, 6 ounces.

A tunnel in former times had been run in on the vein about 240 ft., exploring the oxidized zone. This reached a point where the vertical depth was over 70 ft., and a vein of zinc about 8 in. wide was showing along the bottom of the drift for 50 ft. A winze was started in this ore, and the first 40 ft. produced a car of ore that returned 50.9 per cent. zinc. Most of the ore shipped since then would have also yielded this percentage, if it had been as carefully handsorted.

This ore has been explored to a depth of 300 ft. below this tunnel level, and 700 ft. along the vein. There has been no break in the ore which has varied from 8 in. to as high as 5 ft. of zinc blende of the above analysis. The vein occasionally splits in two parts, with a talc filling between. For each ton of high-grade shipping ore mined about two tons of a low-grade ore are taken out, and piled up for the mill. This lower grade is due to the difficulty of saving the friable zinc blende while breaking down the harder rock, and consists of rich ore mixed with barren material. There are two parallel veins.

Since April, 1908, when the first car of ore was shipped, the Union Basin Mining Company has steadily pushed its development work and shipments, until now its monthly shipments to the Bartlesville Zinc Company are about 800 tons of 47 per cent zinc. The total shipments amount to 7500 tons. Twice this amount of concentrating ore, practically free from pyrites, has been piled up for milling. The levels already opened will yield about three times the amount already mined.

The success of the Union Basin Mining Company, when it is considered that the mine furnished the working capital and the funds to pay for its holdings, has been the most striking of any in this section. This is due mainly to the persistence of the orebody and the freedom of the zinc blende from pyrite.

THE FUTURE OF THE DISTRICT

The deepest development on the mine is 335 ft., and the zinc is practically the same as when work was started. There are no deep workings in the district to serve as a guide, and what further development will show can not now be told, but there are no indications of any change at the present depth. The total zinc production of the district so far has been by the Union Basin Mining Company.

That this small section in the Cerbat range has considerable zinc ore there is no question. In general the gold and silver contents of the blende are low, but some small veins run as high as 1 oz. gold and 30 oz. silver to the ton. The chief drawback to present working and shipping is the fact that in all deposits of any size so far as known, except that of the Union Basin Mining Company, the zinc blende is intimately intermixed with pyrite. With proper separating machinery, however, it is probable that this will be a blessing in disguse, as the pyrite carries in most cases much more gold and silver than does the blende.

It is generally understood that the large buying of prospects, and even in some cases of properties with some development on them, has been for the United States Smelting, Refining and Mining Company, or interests under their control.

Bismuth in Bolivia

Most of the world's supply of bismuth is drawn from Bolivia, where Aramayo, Francke & Co., Ltd., is the chief producer. In its report for 1909 this company stated that its Tasna mines continue to produce bismuth at a rate sufficient to supply the market and are in as good a condition as they have ever been. The same company has accumulated at its smeltery at Quechisla a lot of copper-bismuth matte, containing about 12 per cent. copper. Efforts have been made to devise an economical method for the treatment of this. In so far as the copper is concerned the result of a bessemerizing process has been unsuccessful, but on the other hand the company states that it has been successful in establishing a system to extract the bismuth and is now able to get that metal from this matte at a lower cost than the bismuth obtained directly from the produce of the mines. The sales of bismuth in 1909 showed a large increase over 1908.

The Prairie Oil and Gas Company on March 17 advanced the price of high-grade mid-continental oil from 35 to 38c. and fuel oil from 28 to 30c. The change is the first in the price of fuel oil since March, 1907.

Notes on the Metal Losses in Copper Slags

Physical Losses Due to Incomplete Settling and Gas Flotation of Matte. Chemical Losses Arise from Oxidation and Solution of Metals and Sulphides

BY C. A. GRABILL*

I note a contribution[1] by Lewis T. Wright on metal losses in copper slags, and as data in that line are limited I will add some from portions of the field beyond that included in Mr. Wright's figures and representing work where the proportion of the noble metals was greater than ordinary.

Broadly speaking there are two general classes to which all such losses may be assigned, physical or mechanical losses and chemical losses. The first of these classes is due to three causes: Insufficient settling; insufficient difference between the specific gravities of matte and slag, and flotation of the matte by gases. These causes, or rather the conditions which are responsible for them, in modern reduction works are or ought to be abnormal. Of course there are times and places where, owing to physical or commercial reasons these factors may interfere with the metallurgist's peace.

Losses Due to Insufficient Settling

The regularity of the losses at widely separated plants and in different modes of smelting, and settling experiments on both large and small scale show that the losses from insufficient settling are small. Settling experiments on a small scale are, unfortunately, difficult to accomplish. If we could obtain some method whereby the assay office could make a regular return, not only of the valuable metals in the slag, but of that proportion due to faulty furnacing, and that due to the composition of the charge, furnace control would be much advanced. But settling experiments, such as can be carried out in laboratories with present equipment, are poor criteria by which to judge work. Who is to say what influence the container has; or the time factor; or temperature; or the gases in contact with the slag?

Specific Gravity

The second cause is frequently overrated. It may come into action in case of heavy barium slags or with very zinky mattes in the presence of high iron slags but these are not normal conditions. The determination of the specific gravities of the cold materials is not especially useful, as the expansion of slag with the temperature is much more rapid than that of matte and its change of volume on solidfying is also more marked.

Gas-Flotation Losses

The last cause is also unusual, but I think more common than it is given credit. My attention was drawn to it several times recently. A furnace had been banked for a considerable length of time, and on starting it showed a clear case of flotation of matte by gas. The first slag that appeared was thick, sluggish and chilled quickly although there was plenty of it and it seemed brighter or rather whiter than normal. Tests showed that while the regular temperature was from 1100 to 1200 deg. C. this slag was only from 1000 to 1050 deg. C. in spite of its appearance. On passing through the settlers much matte appeared in the slag pots as minute specks on the surface of the slag. Most of these were about the size of a pinhead. They were continually rising to the surface of the slag until it chilled. On cooling a small button of matte might be found in the pot, but the surface of the slag was covered with small flecks and underneath the top crust were a great many matte shot while others were distributed throughout the pot.

On tapping the settler matte appeared as usual but was followed by a mush-like material that chilled quickly in the taphole unless watched carefully. A potful of this material was allowed to settle and cool and on breaking showed a large button of porous matte, a porous slag full of bubbles and matte-shot, and a layer of matte-shot in, on and under the top crust. An additional settler and settling pot were of little help although ordinarily the pot alone was sufficient for a fairly clean separation. As soon as the slag reached its usual temperature, which was in a short time, it became clean.

Examination of Matte Shot

Analysis of the slag and matte showed no marked difference in composition from the regular run. The sulphur in the matte was 2.5 per cent. above that being produced regularly. Examination of the matte-shot showed that many were hollow, being a mere film; others were solid, spherical or pear shaped, and supported by a bubble of gas at the upper part. Those of the latter form on reaching the surface of the slag were released and sunk back, but the hollow ones broke and made a small patch on the surface, not having sufficient weight to break the surface tension of the slag and remained there until cool.

The slag ran about 46 per cent. SiO_2 and the phenomenon was probably due to the fact that during the banking of the furnace more or less magnetic or ferric oxide had been formed in the furnace with a considerable amount of cold matte and slag. On starting, hot slag and matte were added to this and the equilibrium was disturbed, resulting in the reduction of the oxides by the matte,

TABLE I. AVERAGE ASSAYS OF COPPER MATTES AND SLAGS.

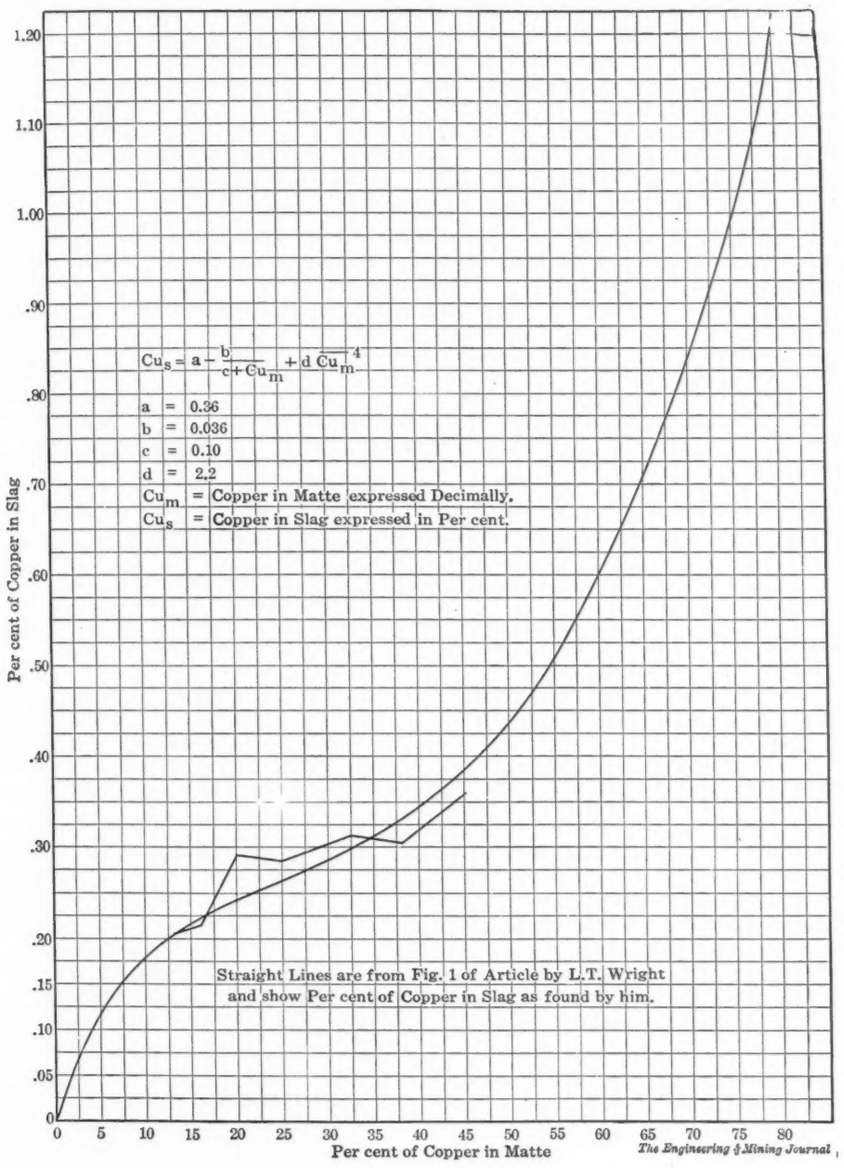
Description.	Oz. per Ton.		Per Cent. Cu.	Oz. per Ton Cu.	
	Au.	Ag.		Au.	Ag.
(1) Slag, first part of month	0.0232	0.299	0.342	6.78	87.5
Matte first part of month	8.47	60.3	27.8	30.4	216.7
(2) Slag, second part of month	0.0256	0.602	0.373	6.86	161.5
Matte, second part of month	10.8	125.9	24.8	43.5	507.0
(3) Slag for month	0.024	0.397	0.352	6.82	112.6
Matte for month	9.22	81.7	26.7	34.5	305.5
(4) 5 slags lowest in gold	0.01	.....	0.36	2.78	.....
Mattes corresponding	12.11	.....	36.3	33.4	.....
(5) 5 slags highest in gold	0.04	.....	0.36	11.1	.....
Mattes corresponding	11.15	.....	25.3	44.0	.....
(6) 8 slags lowest in silver	.....	0.19	0.27	.....	70.3
Mattes corresponding	.....	53.0	24.9	.....	212.5
(7) 5 slags highest in silver	.....	0.88	0.50	.....	176.0
Mattes corresponding	.....	218.85	44.8	.....	488.5
(8) 6 mattes highest in gold	18.85	.....	48.1	39.2	.....
Slags corresponding	0.0217	.....	0.458	4.73	.....
(9) 7 mattes lowest in gold	6.09	.....	18.1	33.6	.....
Slags corresponding	0.0171	.....	0.236	7.25	.....
(10) Mattes, 70 to 100 oz. Ag for first part of month	.....	86.2	42.1	.....	204.5
Slags corresponding	.....	0.290	0.440	.....	65.9
(11) Mattes, 70 to 100 oz. Ag second part of month	.....	81.9	15.3	.....	535.0
Slags corresponding	.....	0.543	0.321	.....	169.2
(12) Black copper	.....	95.1	95.3	.....	99.8
Slag (excess fuel)	.....	0.262	1.37	.....	19.1
(13) Matte high in silver	.....	392.0	39.5	.....	993.0
Slag corresponding	.....	1.76	0.318	.....	553.0
(14) Matte same place as above	.....	182.3	37.2	.....	490.
Slag corresponding	.....	1.05	0.322	.....	326.
(15) Matte low in copper	4.01	.....	6.95	57.6	.....
Slag corresponding	0.0268	.....	0.133	20.2	.....

*909 Montana street, El Paso, Texas.

[1] *Bull.* A. I. M. E., Sept., 1909.

as the temperature rose; but it still being low the time of reaction was unduly lengthened and was not completed until the slag had passed the settlers.

Another tenable explanation is that while the furnace was idle considerable matte with a low melting point, say 900 deg. C., had accumulated in the crucible of the furnace. Matte formed from pyrite would probably have, if this temperature had not been exceeded, about 36 per cent. sulphur; that is the decomposition of pyrite would at this temperature yield FeS. On starting the furnace, slag of higher temperature was formed, and mingling with the colder matte raised its temperature to a point where the FeS decomposed to Fe_7S_8, the escaping gas being sulphur. On cooling, the small amount of sulphur would be re-absorbed by the matte or slag with which it was in contact and leave no visible trace. The higher sulphur in the matte from the foul slag would seem to support this, but I am inclined to think the first explanation the more probable. I have noticed traces of this condition in almost all slags from low-grade matte. With settlers of large capacity and ordinary furnace conditions its effect is slight.


$Cu_s = a + \frac{b}{c + Cu_m} + d\,\overline{Cu}_m^{\,4}$
a = 0.36
b = 0.036
c = 0.10
d = 2.2
Cu_m = Copper in Matte expressed Decimally.
Cu_s = Copper in Slag expressed in Per cent.
Straight Lines are from Fig. 1 of Article by L.T. Wright and show Per cent of Copper in Slag as found by him.
Per cent of Copper in Slag
Per cent of Copper in Matte
The Engineering & Mining Journal

CURVE SHOWING LOSSES OF COPPER IN SLAG

CHEMICAL LOSSES

The second general class, chemical losses, is responsible for the usual condition of things at a well regulated plant and may be divided into: (1) Losses due to solution of the metals or their sulphides; (2) losses due to slagging as oxides, ferrites, silicates, etc. I have not included losses due to the solution of matte because, as Mr. Wright's factor shows, it does not ordinarily occur. I agree with him that solution of the sulphides, individually, does occur but I would extend it to include metals and oxides. Matte itself is a mutual solution of Cu_2S and FeS, the former increasing the solubility of the mixture for gold and silver (silver sulphide being soluble in both), and the latter adding the property of dissolving iron, copper, magnetic oxide, and more or less of other miscellaneous substances such as zinc sulphide, lead sulphide, etc. FeS is a good solvent for copper and will take up from one to two times its own weight.

I have seen mattes as low as 6 per cent. copper showing moss copper and containing 25 to 28 per cent. sulphur, indicating that even in them part of the copper was metallic. Doelter states, in an article which I regret I have only seen in review, that melted slags are highly dissociated, and this is confirmed by their sudden increase in electrical conductivity at or near their fusion point. It would be reasonable to suppose therefore that the dissolved substances are also more or less dissociated, and the solvent action would necessarily be for each component of the matte and not for the group. Looking at it in this way copper itself would seem to be a substance divided between two solvents: i. e., FeS and slag rather than the gold and silver being divided between the copper in the slag and that in the matte.

CONSTANT RATIO OF THE SOLUTE

It would not, however, mean that the law of a constant ratio of a substance divided between two solvents would apply. The law is, that if a substance be dissolved in two solvents, insoluble in each other, and in both of which the solute has the same molecular weight, then the amount of the solute present in unit volume of one solvent will always bear a constant ratio to that in unit volume of the second solvent irrespective of the amounts present, temperature being constant. Put in plain English this means that if applicable to the copper in matte and slag the per cent. of copper in the slag would always be a fixed per cent. of the per cent. of copper in the matte; that is, $S = aM$ where S is the assay of the slag, M that of the matte and a the constant giving the relation between the two. Unfortunately for convenience slags do not seem to follow this rule, but follow more nearly the equation $S = a - \frac{b}{C + M} + d\,M^4$ where a, b, c and d are constants suitably taken.

Fig. 1 shows this plotted over the diagram on which Wright plots his assays. It is by no means exact as small changes in the composition of a charge will sometimes make a great deal of difference in the assay of the slag as will be shown below. That it may represent certain facts is possible. For example: The quantity a may be the solubility of pure Cu_2S in the slag at the point of separation, the second factor representing the failure to attain that point owing to the presence of the matte, M in the denomi-

nator representing the decreasing effect of the matte as its copper contents increase; the last quantity may be the effect of the increasing amount of metallic copper, copper oxide and decreasing of the FeS in the matte.

If we could find a method of determining the osmotic pressure of the dissolved materials in the slag we might arrive at some method of computation that would be of real value but it would certainly require more variables. Metallic copper is soluble in glass under certain conditions and according to Dammer advantage is taken of this fact in the preparation of aventurin glass, the glass holding as much as 5 per cent. copper under certain conditions before copper crystals form. Gold and silver are supposed by some investigators to do the same.

Condition of Copper in the Slag

It seems rather improbable that copper oxide and sulphide can exist together in slag, particularly at the higher temperatures, in a more or less dissociated condition. Melted copper oxide slag, or overblown converter slag, is not a stable material when mixed with molten matter in large amounts and there is no particular reason for supposing it is stable in small quantities. It seems that copper in the slags from low-grade mattes occurs as sulphide and metallic copper and as metallic copper and oxide in slags from the richer mattes and black copper. It follows then that any condition in the furnace tending to produce metallic copper such as oxidized ore, low fuel and blow holes would render the slag foul or at least tend to do so. For example, one end of a furnace might be normal and produce a matte high in copper, while at the other, owing to a blow hole, oxides might be forming which would react with the first part of the matte from the remainder of the furnace and form metallic copper, which would be taken up by the balance of the matte but with a reduced solubility as it is already high in copper. Consequently the slag would tend to absorb more than the proportion corresponding to the grade of the matte.

Table 1 given herewith represents the work at a certain smeltery for one month, the samples being those of the day and night mattes and slags combined in averages for different conditions as noted. Also other samples from various places. The third group represents 60 samples each of matte and slag, the others vary from five up. While not so many as those quoted elsewhere they may be interesting from their individuality.

These slags and mattes were all produced by semi-pyritic smelting except No. 12 and perhaps Nos. 13 and 14, which approximated strict matting. Nos. 1 to 11 are different groupings of the samples of No. 3. The others are from other localities.

Solubility of Gold in Matte and Slag

The gold assays of the slags present one marked regularity and that is that the quantity seems to be constant irrespective of the amount in the matte, the copper in the matte or any other factor tabulated. This is borne out by plotting. Of the 60 assays only 10 vary from the mean, 0.024, more than to the nearest hundredth; of these five are high and five are low and both groups appear with mattes above the average in gold and the copper in the two sets of slags is identical. The copper in the accompanying mattes is 36 per cent. for the low golds and 25 per cent. for the high one, which would seem to indicate that the gold varied inversely with the copper in the matte, but No. 15 which represents a month's run at another plant has a matte of less than 7 per cent., and yet the slag is only 0.002 of an ounce higher than the general average at the first plant, No. 3 with 26 per cent. of copper.

It is true that the seven mattes lowest in gold accompany slags lower than the average but so do the six mattes highest in gold. Gold sulphide is readily decomposed by heat. It would seem therefore that at a temperature at which iron and copper sulphide begin to give up their sulphur, gold can exist only dissolved as metal. Metallic gold in excess seems to be responsible for the color of ruby glass, the solution at high temperatures being colorless and showing its characteristic color only on standing at the softening point, that is, at a point where the solubility is diminished. That being the case it would seem that the gold in the slag should vary directly with that in the mattes. It probably does but the effect is obscured in the samples under consideration by the fact that the copper in the matte increases with the gold and increases the selective solubility of the gold in the matte at the same rate.

Gold is insoluble in FeS and hence its solubility in matte is due to the copper present; therefore if we double the copper, other things being equal, we should double the solvency for gold as compared with slag, and halve the gold contents of the slag; but in the cases given here, if we double the copper in the matte we double the gold and also double the gold in the slag.

Solubility of Silver in Matte and Slag

The case of silver is more apparent. It is soluble in iron sulphide but more so in copper and particularly in Cu_2S. It probably dissovles as metal and sulphide, perhaps as chloride and possibly but improbably as oxide. It dissolves in glass as does gold. We should expect therefore that the copper in the matte would tend to increase the solubility of silver in matte and decrease the slag assays but that its effect would not be so marked and that the silver in the slag would approximate the amount required by the law of constant ratios. They do. Referring to No. 1 and No. 2 we see that the silver in the matte doubles and so does the silver in the slag, the copper in the matte remaining practically constant.

TABLE II. SHOWING INCREASED LOSSES IN GOLD AND SILVER BY CHANGING THE CHARGE.

	Gold, Oz.	Silver, Oz.	Copper, Per Cent.	Iron, Per Cent.	Insoluble, Per Cent.	CaO, Per Cent.
(1) Matte	6.8	36.6	20.4			
Slag	0.02	0.2	0.27	26.2	36.9	16.3
(2) Matte	10.3	62.7	42.9			
Slag	0.02	0.25	0.30	30.0	35.3	12.2
(3) Matte	7.7	40.9	21.1			
Slag	0.04	0.45	0.38	35.3	34.7	....
(4) Matte	7.65	39.3	16.6			
Slag	0.04	0.5	0.30	33.5	37.3	7.6
(5) Matte	8.0	42.0	17.5			
Slag	0.05	0.45	0.45	35.1	35.5	5.8
(6) Matte	7.2	38.9	12.9			
Slag	0.03	0.25	0.25	32.7	36.1	11.1

On the other hand, taking Nos. 10 and 11 we see that by raising the copper in the matte from 15 to 42 per cent. the silver in the slag is diminished from 0.54 to 0.29 oz. per ton, the silver in the matte remaining nearly constant. This holds for Nos. 13 and 14, monthly averages at another plant, and approximately even for the black copper in No. 12.

Of course, I am far from saying that other things have no effect and I give here Table II to show what a small change in the charge may do, although I have never had anything as marked in my own experience.

The furnace was running on a semi-pyritic charge yielding products of which Nos. 1 and 2 are shift samples. The charge was changed by substituting an oxidized iron ore carrying 7 per cent. of TiO_2 for one-half of the CaO, with the result of which Nos. 3, 4 and 5 are shift samples. It was changed back with the result indicated by No. 6. This was tried several times with the same result and stopped for obvious reasons. The change doubled the gold loss, increased the silver loss 50 per cent. and the copper about one-third. As to the cause, whether decreased lime or not, each can judge for himself.

If we could assume that gold dissolves as metal, silver as metal and sulphide, and copper as metal and sulphide and as oxide in mattes of 70 per cent. and over, it seems that in a rough way we may state the amount so dissolved by the equations presented in the next column.

$$Cu_s = a - \frac{b}{c + Cu_m} + d\sqrt[4]{Cu_m}$$

$$Ag_s = a\frac{Ag_m}{\sqrt{Cu_m}}$$

$$Au_s = a + b\,Au_m - c\,Cu_m$$

Cu_s, Ag_s and Au_s are the copper, silver and gold, respectively, in the slag and Cu_m, Ag_m and Au_m are the copper, silver and gold in the mattes. The letters a, b, c and d are suitable constants. They give fair results applied to furnaces yielding slags of similar composition, but of course do not express results due to variations in composition of charge.

Annual Report of Phelps, Dodge & Co.

The copper-sales department of Phelps, Dodge & Co. marketed, in 1909, 185,033,415 lb. of copper. Dividends amounting to $5,396,652 were paid, and the company carried forward a surplus of $446,559 at the close of the year. During the year the Burro Mountain copper mines, in New Mexico, were acquired and partially paid for. It is intended to hold this property as a large ore reserve, and about 2,000,000 tons of ore have already been exposed.

PHELPS, DODGE & CO.

BALANCE SHEET, DEC. 31, 1909.

Assets.	
Cash	$2,114,814
Bills receivable	18,862
Accounts receivable	764,739
Stocks owned:	
Copper Queen Consolidated Mining Company	26,989,605
Moctezuma Copper Company	8,000,000
Detroit Copper Mining Company of Arizona	6,000,000
Stag Cañon Fuel Company	4,000,000
Burro Mountain Copper Company	1,487,640
	$49,375,660
Liabilities.	
Due to subsidiary companies and others	$3,939,496
Capital stock, 449,896 1/10 shares issued	44,989,605
Surplus	446,559
	$49,375,660

COPPER QUEEN

The production of the Copper Queen mines is given in an accompanying table. In addition, small shipments of copper and lead-silver ores were made by leasers.

COPPER QUEEN MINES PRODUCTION, 1909.

	Tons.	Copper, Lb.	Silver, Oz.	Gold, Oz.
Mined and shipped to reduction w'k's	566,518	83,010,976	585,075	8,239
Mined and shipped to other points	28,833	1,249,807	7,777	405
Precipitates made and shipped to Douglas	272	169,008	76	
Total	595,623	84,429,791	592,928	8,644

The following development was done: Shafts, 308 ft.; drifts, 45,363; raises and winzes, 14,649 ft. New ore-bearing territories were discovered and partially developed at several points, notably in the Uncle Sam country, on the lime contact with the western boundaries of the Sacramento hill porphyries and in the lower levels of the Lowell mine. No data as to working costs at any of the Phelps-Dodge properties are given, but it is stated that at the Copper Queen, extracting ore accounted for 38.76 per cent. of the total mining cost; development and repairs, 31.31; tramming, hoisting and loading, 14.75; taxes and miscellaneous, 11.14; freight, 4.04 per cent.

Mining is carried on by the square-set system. Superintendent Gerald Sherman says: "As we extract most of our ore from irregular masses embedded in great bodies of soft, decomposed material which is in constant motion, we cannot block out ore for purposes of measurement. But I can state that there is as much ore in sight today as at any period during the past 10 years while I have been manager of the property."

PRODUCTION OF COPPER QUEEN SMELTERY.

	Tons, Tre't'd.	Copper, Lb.	Silver, Oz.	Gold, Oz.
Copper Queen ores and precipitates	544,963	75,466,772	534,151	8,938
Copper Queen slags and cleanings (Bisbee)	7,669	402,633	87	.....
Moctezuma ores and concentrates	112,563	24,814,747	421,648	1,054
Custom ores	70,295	7,858,812	1,623,925	22,160
Total production	735,490	108,542,964	2,579,811	32,152

At the Copper Queen smeltery there was in operation an average of 7½ blast furnaces and 5.8 converter stands, the plant consisting at the present time of ten blast furnaces and eight stands of converters. The ores treated are enumerated in an accompanying table.

DETROIT OPERATIONS

The Detroit Copper Mining Company mined 449,977 tons of concentrating ores, 8898 tons of smelting ore, and 10,007 tons of silicious ores for converter linings. The concentrating department reports that 451,642 tons of Detroit ore assaying 3.106 per cent. copper, were concentrated, producing concentrates assaying 15.85 per cent. copper, and making an extraction of 78 per cent. The tailings assayed 0.8 per cent. copper; concentration ratio was 6.57 to 1; 332 gal. water were used per ton of ore milled; and 1293 tons were milled for each 24 hours' actual running time.

The smelting and converting department reports a saving of 94.5 per cent., and the output is given in an accompanying table.

ORES SMELTED, 1909, DETROIT MINING COMPANY.

	Tons Ore Treated.	Bullion Produced, Lb.	Assay of Original Ore, Per Cent. Copper.	Yield in Bullion per Ton Ore, Per Cent. Copper.
Concentrating ore	449,357	20,430,650	3.106	2.273
Smelting ore	8,753	2,547,000	15.39	14.55
Silicious ore to converters	7,650	770,560	5.316	5.03
Total Detroit ore treated at Morenci works	465,760	23,748,210	3.373	2.55
Silicious ore shipped to Douglas	2,340	243,385	5.77	5.2
Total Detroit ores treated at Morenci and Douglas	468,100	23,991,595	3.385	2.562
Purchased ores treated at Morenci	4,150	599,426	8.191	7.22
Total ores	472,250	24,591,021	3.427	2.605

MOCTEZUMA AND STAG CANYON

The Moctezuma Copper Company produced 517,927 tons of ore, of which 510,094 tons averaging 3.22 per cent. copper were concentrated. The average tonnage treated per day of running time was 1,475.93 tons; the average grade of concentrates, 11.80 per cent.; the ratio of concentration 4.61 to 1; the yield 2.56 per cent. and the average assay of tailings 0.584 per cent. During the year, Moctezuma's Pilares mine in the state of Sonoro, Mexico.

The Stag Cañon Fuel Company, at Dawson, N. M., mined 1,087,768 tons of coal and drove 44,086 ft. of entry in mines Nos. 1, 2, 4 and 5. A system of electric shot firing was introduced, which has given satisfaction and has reduced accidents to a minimum.

Charging and Cleaning Machine for Zinc Furnaces

Machines Electrically Operated. Time Required for Charging 120 Muffles, 20 Minutes; Cleaned in 30 Minutes. Wage Saving, 50 Per Cent.

BY O. SAEGER*

In the management of zinc reduction works the most important operations, the charging and cleaning out of the muffles or retorts, require a large staff of skilled workmen who have to perform their hard and unhealthful labor under relatively unfavorable conditions. The dust-raising charge in front of the furences has to be introduced into the narrow muffles or retorts by innumerable throwing movements in an unnatural position of the body. The withdrawal of the white-hot residues from the muffle necessitates the furnace crew approaching the furnace which has a temperature of about 1000 deg. C. The men cannot avoid inhaling the dusty and gaseous impurities of the air emanating from these residues, although the very best appliances are used for drawing off the gases. Hence, it is obvious that the conservation and replacement of skilled furnacemen is becoming more and more difficult and that wages have to be raised constantly.

Unhealthful Operation Now Performed Mechanically

In other metallurgical processes similar economic and hygienic drawbacks have been overcome by the introduction of mechanical appliances. Serious difficulties have been met in trying to introduce devices for mechanically filling and cleaning the zinc furnaces. I tried to load and discharge upright muffles in the same manner in which upright coke retorts are manipulated. The experiments failed, for the same reason that all attempts to produce zinc in shaft furnaces have failed. Economically, the output of zinc had been much more favorable than in the shaft furnace experiments, but quite unsatisfactory in comparison with the yield of the regular zinc furnaces with slanting muffles which have been retained.

It became necessary to adapt the apparatus to the one- and more-story zinc furnaces already existing without materially disturbing their construction. The machines were required to fill rapidly the numerous narrow and hot muffles, difficult of access and individually holding little charge, without raising dust and without manual labor; and, after the completion of distillation to clean them rapidly in order to complete both operations in the least possible time.

*General manager of the zinc works of Georg von Giesche's heirs, Rosdzin, Upper Silesia, Prussia.

NOTE—Translated from *Metallurgie*, Jan. 22, 1910.

The Charging Machine.

The mechanical apparatus shown in Figs. 1 and 2 fills the above requirements.

The filling or charging machine has essentially the following parts: The lower truck *a*, the upper truck *b*, the charge hopper *c*, the gutters *d*. The lower truck *a* consists of a strong iron frame running along the furnaces and is provided with a platform for the motorman and the upper truck *b*. This upper truck can be moved forward and backward at right angles to the running direction of the lower truck on the rails *e*, which are fastened to the lower truck on an incline corresponding to the slanting position of the muffles *m*. The movement of the trucks is performed by cog-wheel gearing connected with the motor. The same motor also runs the screw conveyers *s* in the covered steel gutters *d*, by means of a cog wheel gearing. The mineral charge runs from the hopper *c* into the conveyers in such a manner that each conveyer receives, by a special regulator in the feed pipe, exactly the same quantity of charge. Fig. 1 shows the charging machine at rest in front of the furnace.

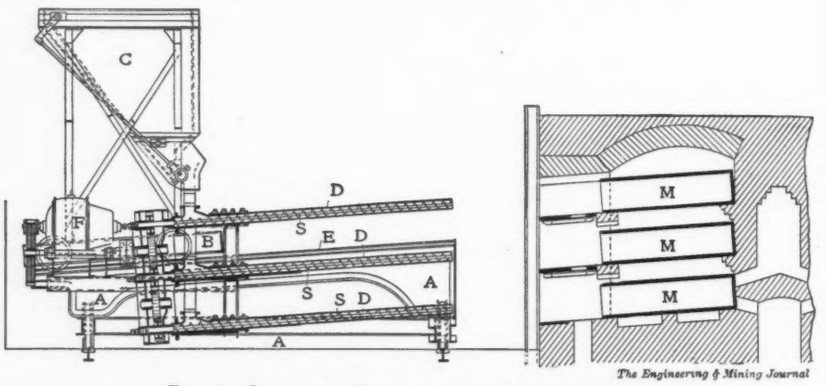


FIG. 1. CHARGING MACHINE FOR ZINC FURNACES

Operation of the Saeger Charging Machine

The motorman sets the lower truck in motion and brings it from the furnace just charged to the adjoining one. By a second pull of the lever he moves the upper truck forward and by a third one the conveyers *s* are thrown into gear as soon as the front ends of the feed gutters *d* enter the muffles *m*, when the charging of the muffles commences. The upper truck moves with the constantly charging gutters up to the rear of the muffles, filling them half full. As soon as the end of the muffle is reached the upper truck, by means of a reversible lever, runs backward automatically, and the conveyers *s*, which are kept in motion until they leave the muffles, fill the space left vacant while entering, more snugly and more completely than a furnace man could do it by hand.

The number of charging gutters to be kept in operation at the same time depends upon the kind of furnace, whether it be a one- or a more-story one. The machine is at present built with eight adjoining feed gutters in one plane, which can be raised or lowered in their entirety from one story to the next. Another machine has six gutters, in two vertical rows of three each. Figs. 1 and 2 show a longitudinal section of the latter design, which adapts itself to the more common three-story furnaces, with two muffles side by side. The results obtained with this machine have been so favorable that the difficult problem of charging zinc muffles mechanically may be considered successfully solved.

Machine for Cleaning Muffles

In order to make the success of the charging machine complete it was necessary to arrange also for a mechanical cleaning of the muffles. The charging machine alone would get through rapidly with its work, but it would operate with constant interruptions if the clearing away of the hot residues had to be done by hand. The cleaning machine is composed of the following main parts:

The lower truck *a*, the upper truck *b*, the clearing or scraping conveyers *s*, Fig. 2. The lower truck *a* consists like the charging machine of a stout iron frame movable alongside the furnaces and provided with a platform

for the motorman, and the guide rails *e* conforming to the slant of the muffles. On the rails *e* the upper truck is moved forward and backward in the axis of the muffles *m* by the motor *f* precisely the same as the upper truck of the charging machine. Upon the entry of the revolving scrapers *s* in the muffles the motorman reverses the motion of the scrapers until they come out of the muffles. During the forward and backward movement the scrapers draw out the residues and drop them into the pit in front of the muffle opening.

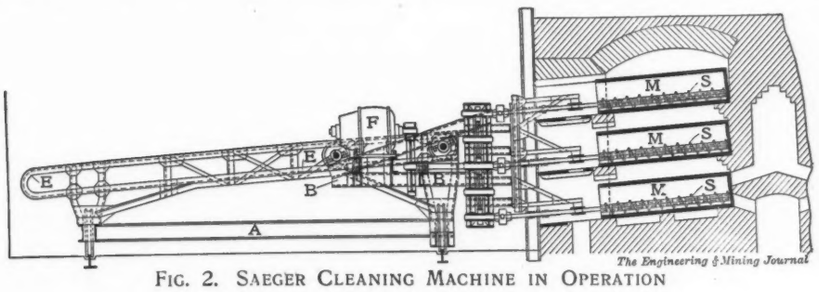


FIG. 2. SAEGER CLEANING MACHINE IN OPERATION

The scrapers, which have to be made as stout as possible, do not suffer excessively from the heat, because they are cooled off considerably in the hot ashes at the furnace after their short spell of work. Notwithstanding, the forward end is made exchangeable and provided with a sprinkling device working automatically with the machine. The seats of the feeding gutters and of the scrapers are made slightly movable in order to allow for small variations in the position of the muffles.

ADVANTAGES DERIVED FROM USE OF MECHANICAL APPLIANCES

According to the results achieved during an uninterrupted campaign of several months at a zinc furnace containing 240 muffles, that is 120 muffles at each side, the 120 muffles were cleaned out by the cleaning machine in 30 minutes and filled by the charging machine in 20 minutes. Hence 15 seconds are required for cleaning and 10 seconds for charging one muffle.

The additional work of zinc drawing, taking off and putting on the receivers, exchanging damaged muffles requires, of course, additional time and the keeping of a portion of the former furnace crew. The real furnace crew may, however, be reduced by one-half and the work which has hitherto taken from eight to nine hours can be performed in a five-hour shift, with the hardest part of the labor avoided.

The saving in wages may be estimated at 50 per cent., no extra expenses being chargeable as the consumption of power by the machines is very slight and the wear and tear not more than that of the furnace tools used when applying manual labor. The most essential advantages of the mechanical charging and cleaning of the zinc furnaces may be briefly stated to be the following:

(1) One-half the wages; (2) more healthful work; (3) shortening of the damaging cooling-off period of the furnaces in cleaning and charging; (4) prolongation of the time for distillation and improving the yield; (5) reduction of the social obligations on account of employment of fewer men; and (6) easier control of the work.

Tin Production in the Province of Yunnan, China

Practically all of the tin produced in China is derived from the Kotieou mines, 30 miles from the railroad in the province of Yunnan. During the last 17 years the recorded output, according to W. F. Collins, in *Bull.* No. 63 of the Institution of Mining and Metallurgy, has shown a steady increase, from 2.7 per cent. in 1891 to 4.2 per cent. of the world's production in 1908.

The whole industry is in the hands of the Chinese, and any interference by Europeans is strongly resented. Methods are primitive in the extreme. Smelting is carried out in furnaces that have been evolved under local conditions. The chief difficulties met with are an absence of water for concentrating the ore, and the high price of charcoal for smelting. It is anticipated that the completion of the railroad may have a stimulating effect on the development of the industry.

ONLY ALLUVIAL DEPOSITS WORKED

The deposits now worked are all of alluvial origin. They are found on the surface or sunk in hollows in the limestone, probably of Middle or Lower Triassic age. There are about 150 mines scattered over an area 25 miles long by 20 miles broad. The deeper deposits are much richer and in this case the open-cast method of mining has been abandoned for true underground work, or rather burrowing, for European and American methods have not been adopted. The tin stone is usually sand-grain size, and occurs with iron deposits. The ore usually contains a little magnetite and as much as 55 per cent. hematite. There is always a small percentage of lead in the ore. The amount of ore mined in any year is chiefly dependent upon the rainfall and the amount of capital available. Since almost all of the companies are small, the working expenses have to be paid directly by the output, which is sold as concentrate. Little mining is done until the rainy season, which usually lasts from May to September.

A short distance from the entrance of the mines, the atmosphere is so foul that the lamps will not burn, so that the digging, sacking and carrying the ore to the surface by the miners is performed in the dark. Wind-boxes are used in some mines to aid ventilation. There is no regular circulation of air.

GOVERNMENT REGULATIONS

The mines were, until recent years, subject to a code of provincial mining regulations. These regulations have been abolished in favor of the temporary regulation of the Imperial Government. The mineral now belongs to the Government and neither prospecting nor mining may be done without permission, obtained through the local authorities, from Peking. The miners pay no direct taxes to the government. A small local tax is sometimes paid upon concentrates for the maintenance of roads. The bulk of the taxation is borne by the smelteries, aggregating about 12½ per cent. of metal value. This tax is supposed to go to the maintenance of the standing army. In addition to these taxes the metal pays a maritime export duty of 60c. per 133 lb. Practically all of the tin is exported to Hongkong where the greater part of it is refined by Chinese merchants for European consumption. The accompanying table shows the output for a number of years.

TIN PRODUCTION IN YUNNAN PROVINCE, CHINA.

Year.	Production, Long Tons.	Year.	Production, Long Tons.
1891	1,741	1900	2,898
1892	2,063	1901	3,026
1893	1,923	1902	3,788
1894	2,343	1903	2,443
1895	2,429	1904	2,979
1896	2,013	1905	4,463
1897	2,476	1906	3,948
1898	2,733	1907	3,480
1899	2,568	1908	4,558

Electrical Colliery Installation in Scotland

A Central Generating Plant with High-pressure Distribution Can Deliver Electrical Energy to Any Point for Less Than 3-5 c. per Unit

BY J. B. VAN BRUSSEL*

The following article refers to an interesting application of electricity to coal mines, and some months ago, the plant described was the object of a communication before the Mining Institute of Scotland, at the occasion of a general meeting.

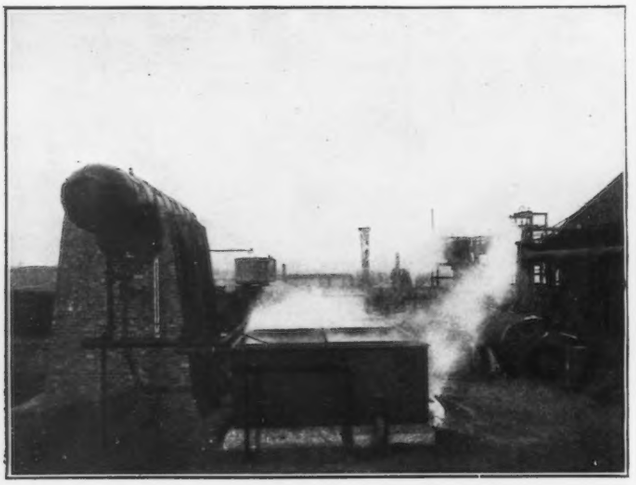
The installation is in operation at the collieries of one of the most important coal companies of Fifeshire, in Scotland. The pits of this company, to the number of ten, are distributed over an area of about 16 square miles, and produce over 1,250,000 tons of coal per annum.

In 1907, the company, which had disposed already of a number of isolated plants, supplying electricity for lighting purposes, decided to go in for a central generating plant with high-pressure distribution to suitable points. It was decided to deal in the first instance with the workshops and five of the pits, these being, the Nellie, Mary, Newton, Jenny Grey and Melgund, but to design the layout with a view to the ultimate inclusion of the whole field in the scheme. Recently the company has acquired a further mine, the "Donald colliery," and this has been included in the area of the new supply.

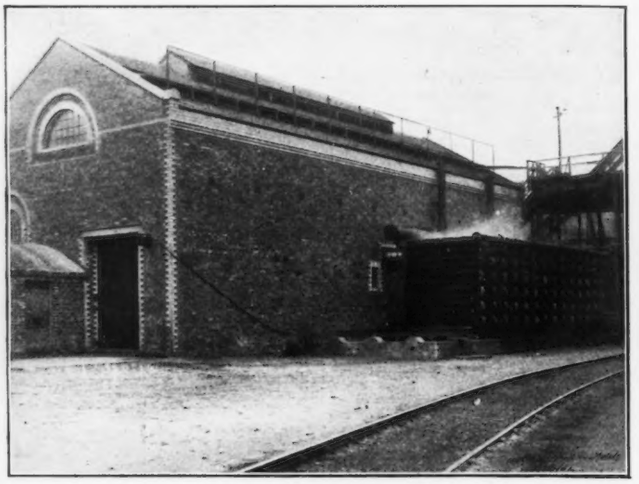
The situation selected for the power house by the consulting engineers for the work, Sayers & Caldwell, of Glasgow, was the Nellie pit, and this generating station now includes two 450 kw. sets and a 1.000-kw. exhaust, or mixed pressure turbo-generator; space is provided for the addition of a third 450-kw. unit.

There are four Babcock & Wilson boilers, set in two batteries. They are constructed for a maximum working pressure of 200 lb. Each boiler is fitted with a chain-grate stoker and internal superheater to give 100 deg F. superheat; the expected maximum evaporation with wet dross and gum is about 10.000 lb. per boiler. For boiler-feed purposes, three single direct-acting steam-driven pumps are installed.

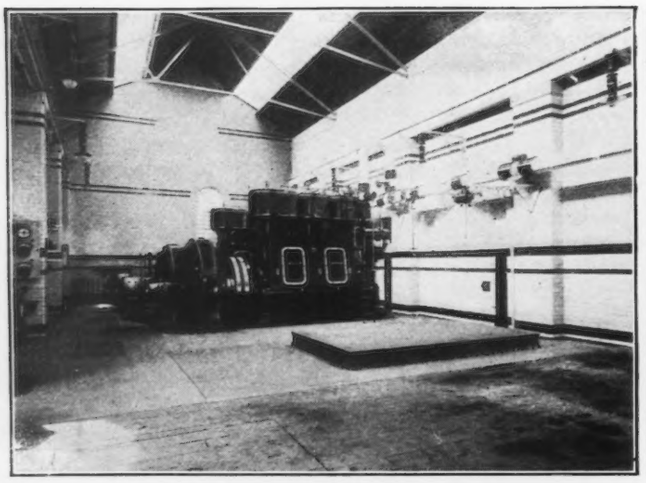
At the present time two Belliss & Mor-



WATER-SOFTENING PLANT AT THE POWER STATION



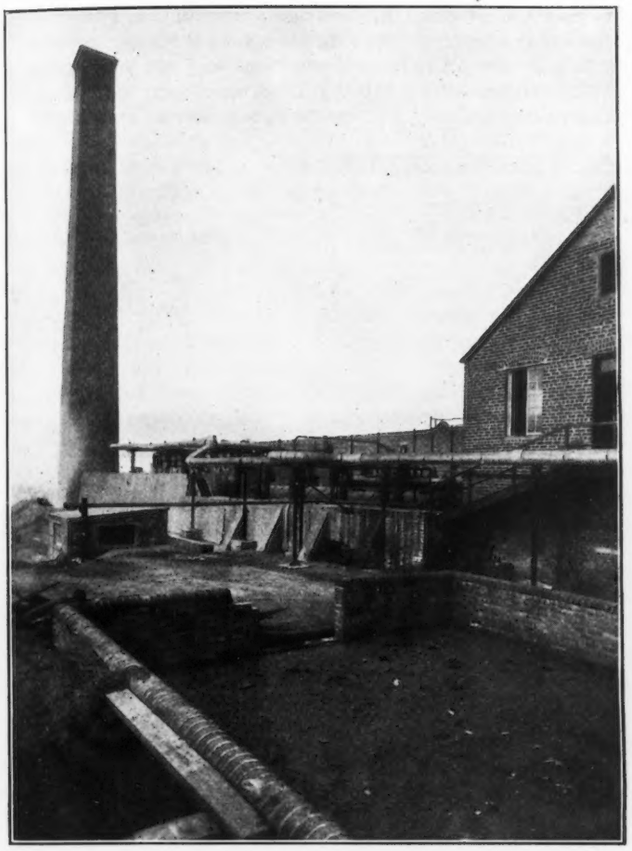
VIEW OF POWER HOUSE AND EVAPORATIVE CONDENSER



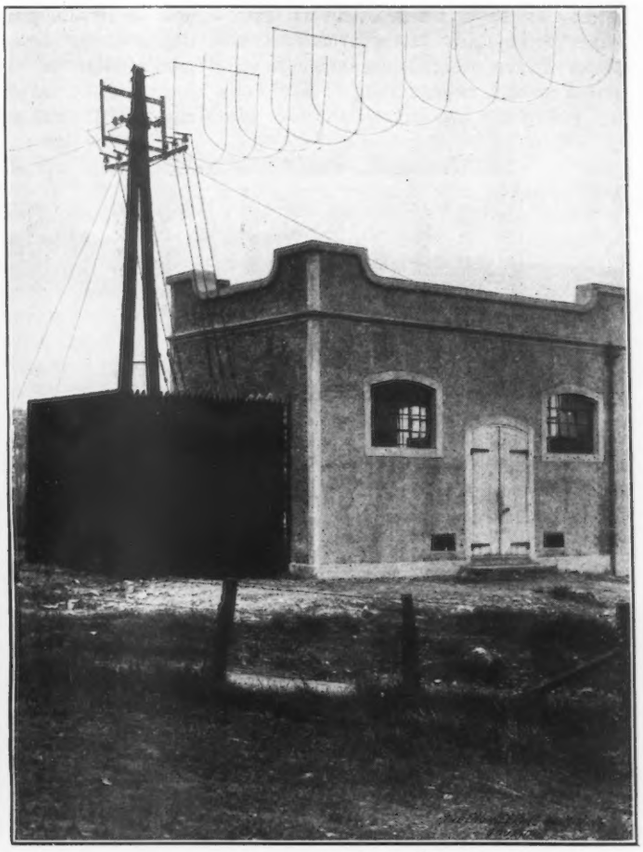
GENERATING PLANT IN THE POWER HOUSE

WATER-TUBE BOILERS FOR THE ELECTRICAL PLANT

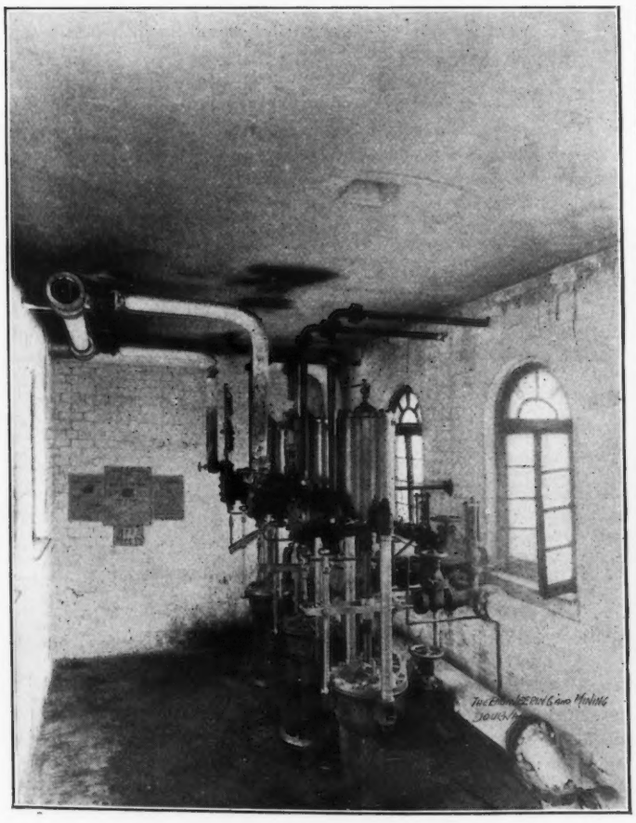
*Brussels, Belgium.



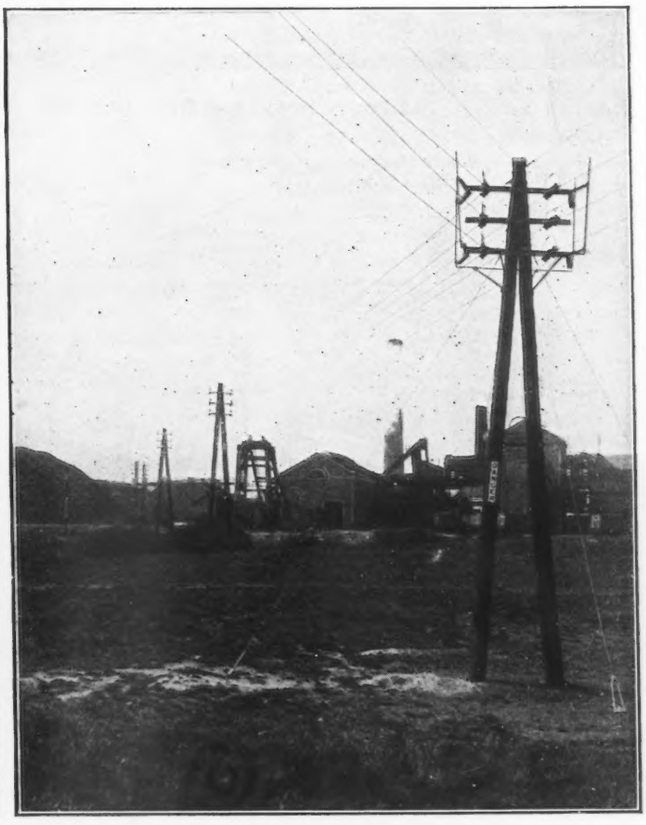
VIEW SHOWING STEAM PIPING AND BOILERS



ONE OF THE TRANSFORMER STATIONS



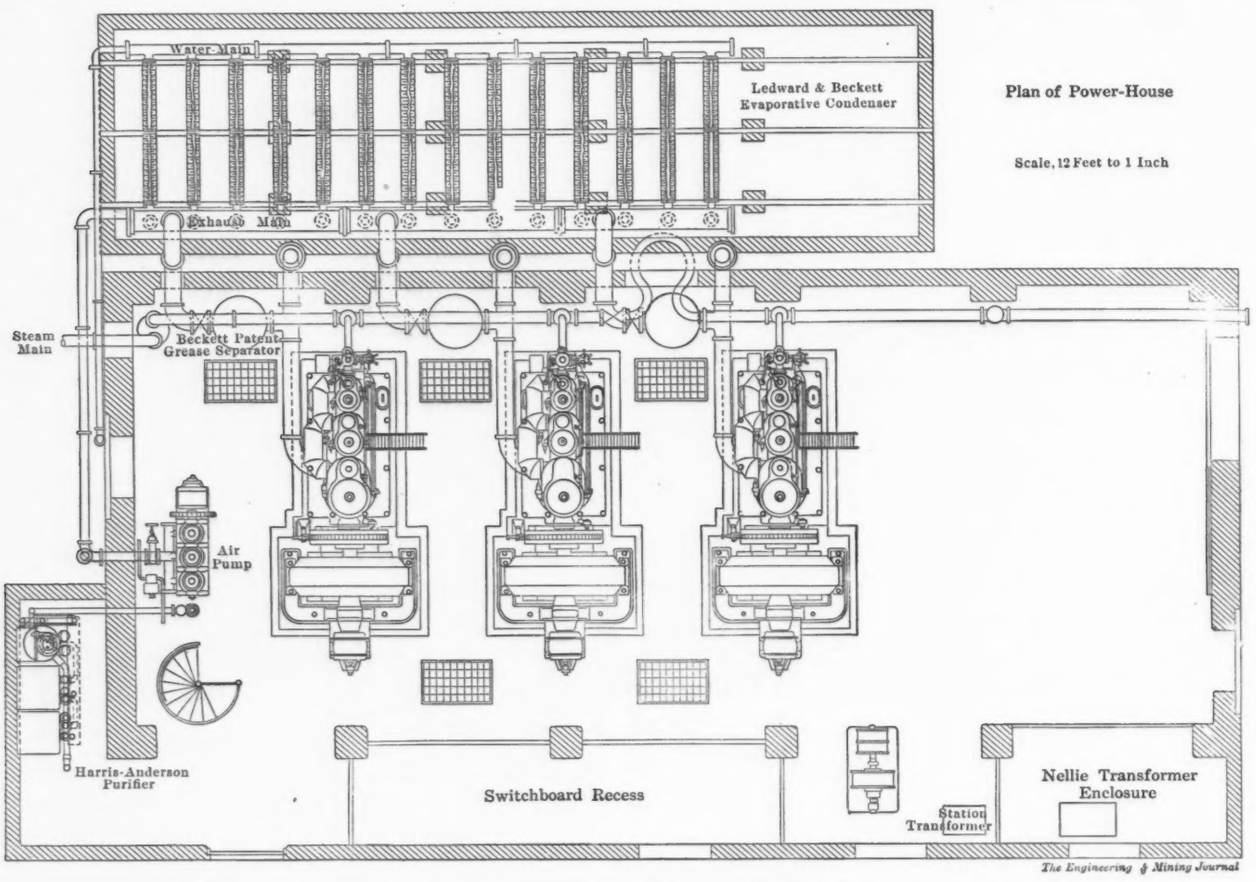
SHOWING PART OF PUMP HOUSE



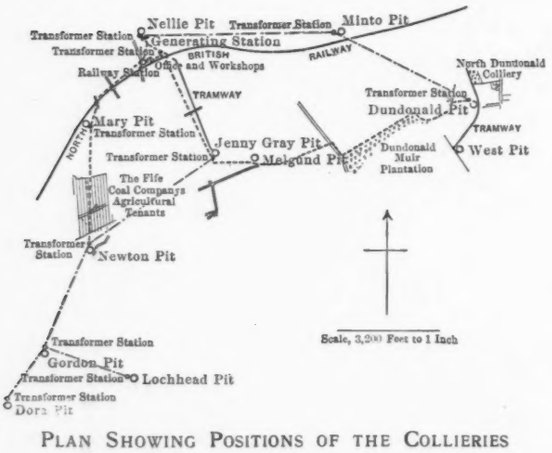
VIEW OF OVERHEAD LINE

com three-crank triple-expansion engines, direct-coupled to Bruce-Peebles three-phase alternators, are provided in the power house. The alternators are 50-period machines, generating at 3300 volts and giving 420 kw. on an 0.8-power factor, and at 375 r.p.m.; they are provided with exciters mounted on the main shafts. These sets will carry 25 per cent. overloads for periods of two hours at six-hour intervals, either exhausting into the condenser with a 26-in. vacuum or to atmosphere.

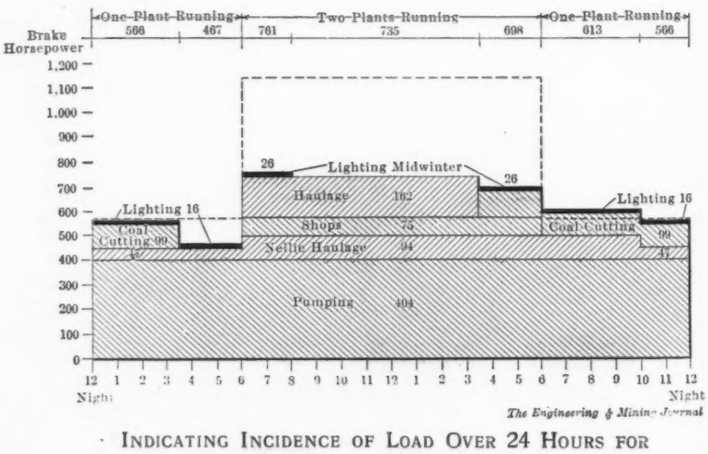
The engines are supplied with steam at 160 to 180-lb. pressure and 470 to 500 deg. F.; both sets on test gave a steam consumption of about 18.3 lb. per kw.-hour with a load of 422 kw., steam pressure 159 lb. and a vacuum of 25 inches.



THE POWER HOUSE HAS BEEN DESIGNED TO PROVIDE FOR FUTURE INCREASE IN CAPACITY



PLAN SHOWING POSITIONS OF THE COLLIERIES SERVED BY THE GENERATING STATION



INDICATING INCIDENCE OF LOAD OVER 24 HOURS FOR ESTIMATED IMMEDIATE REQUIREMENTS OF PITS AND WORKSHOPS

EVAPORATIVE CONDENSER

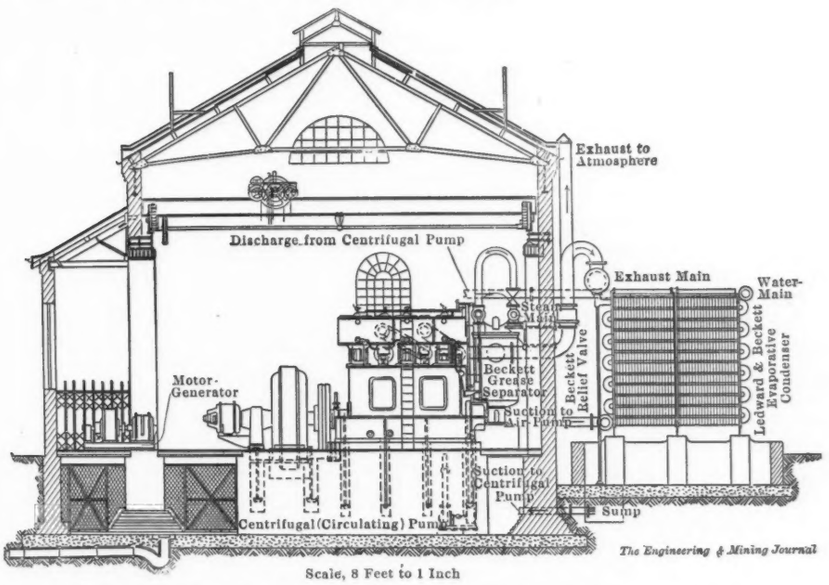
The engines exhaust through atmospheric valves and Beckett oil separators into an 18-in. cast-iron collecting main, feeding a Ledward & Beckett evaporative condenser outside the engine house; the condenser consists of 336 corrugated pipes in 14 coils of 24 pipes each. A film of water is maintained over these pipes by a 3-h.p. motor-driven centrifugal pump, this requiring the circulation of 10,000 gal. of water per hour, of which 800 gal. is evaporated and made up afresh. The adoption of surface condensers would have involved four times as much circulating water, and, in addition, elaborate cooling arrangements.

As regards the power-house switchgear, the high-tension portion consists of four generator panels and six feeder pan-

els; only two of the former and four of the latter being at present fully equipped. The feeder panels in use supply the transformer for the Nellie pit; the transformer for the power-house motors; the overhead line supplying the Mary and Newton pits, the workshops, Jenny Grey pits, and the Dundonald colliery

There are, in addition, two panels dealing with low-tension three-phase current from the power-house transformer. One of these controls a 50-k.w. motor-generator supplying continuous current at 200 volts for the lighting of the power house, Nellie pit-head, and the offices and shops; and the other the air pump, condenser, and centrifugal pump motors. There is also a continuous-current panel controlling the 200-volt lighting supply from the motor-generator already mentioned.

Fixed to the sides of the brick piers, within which the main panels are accommodated, are the synchronizing bus-bar voltmeter and earth-detecting panels. Each generator panel contains a three-pole oil switch with automatic reverse power trip gear, indicating wattmeter, ammeter, etc., and the exciter pillar is arranged in front. The feeder panels each carry a similar oil switch with overload and out-of-balance trips, indicating wattmeter, ammeter, and integrating wattmeter. The low-tension three-phase panels are also fitted with similar oil switches; there are no fuses on any of the three-phase panels. A 10-ton traveler runs the whole length of the power-house.



CROSS-SECTION OF POWER HOUSE SHOWING MACHINERY IN POSITION

HIGH-TENSION DISTRIBUTING SYSTEM

The high-tension distributing system consists of overhead lines from the power station to the Mary and Newton pits to the southeast, and sundry lengths of lead-covered and armored paper cables under the North British Railway track, and from the power-house to the adjacent terminal pole. The general plan gives an idea of the extent of this portion of the work, the heavy dotted line indicating the two lines now in operation of the work, the dotted line from the Jenny Grey pit to the Dundonald colliery, the extension not yet at work, and the chain-dotted lines further extensions, which may or may not be realized. The point, however, of the interconnected network, completed, as shown by these chain-dotted lines, is that in conjunction with the special arrangement of isolating switches in the several transformer stations, any section of line, excepting that from the Newton pit to the south, could be made dead (for repairs or other purposes) without interfering with the supply. The earthing guards have been arranged for operation with the supply from either direction, in view of this linking up.

All cables and apparatus in connection with the overhead lines are protected from the effects of lightning, and excessive pressures from other causes, by spark gaps; and public roads and positions in the vicinity of the pits are guarded by adequate cradling

TRANSFORMER STATIONS

The transformer stations are each designed to contain two 200-k.w. transformers, and the necessary switchboard, but contain only half their equipment at present. The transformers are oil-cooled and wound to transform from 3000, 3150 and 3300 volts to 525 volts, these ratios being arranged to compensate for the varying line losses at different points.

The transformer full-load efficiency is about 97 per cent. The switch-gear in the transformer houses is of Ferranti type, comprising a high and low-tension panel for each transformer, with auto-oil switches, instruments, energy meter, etc.; the gear is designed to automatically cut out a faulty transformer, and on the high-tension side space has been left for a high-tension feeder panel in case it is desired to carry high-tension supply down the shafts. On the low-tension side, three 200-kw. circuits are provided.

The shaft and in-bye cables are three-core bitumen insulated and filled, and double armored with galvanized steel wires; they are supported in the shafts at intervals of 40 to 50 ft. by cleats of special design, and suspended in-bye by hempen slings. Electrical continuity of the armoring throughout each network is effected by substantial armor clamping rings, and the whole is efficiently connected to the best earth obtainable on the several systems.

The latter are of substantial construction, and are designed for underground conditions. Arrangements are also provided on each board by means of auto-transformers for the supply of current to 50 lamps. One of our views shows one of these boards in position.

The sub-circuit fuseboards are of heavy mining type, with porcelain barrel fuses, and have all connections on the front of the slate panels; they are inclosed in cast-iron cases with armor anchor rings, and the lids of braced iron plate are hinged and secured by wing-nuts.

MOTORS

The motors have been supplied for haulage, pump, and fan drives, and include both the slip-ring and squirrel-cage types, with control panels and starting switchgear suitable to the particular requirements of each drive.

As to the outlay, it may be taken that the generating costs, based on the load diagram produced, plus the capital charges; namely, interest on capital, and sinking fund to redeem the capital in 20 years, will enable the company by the equipment described to deliver electrical energy at any point in the coalfield for something less than 3/5c. per unit, and that with an increased load the cost per unit will be even cheaper.

Underground Mine Stables

Underground mine stables should be designed to have sufficient ventilation without drafts; the stalls should be dry and warm, each so partitioned that the horse in it is quite separated from its neighbors, yet still able to see them from a distance, so that biting each other is precluded; horses thrive best when in company. The regulator providing air from the intake should be open to form such area as to allow each horse 250 cu. ft. of air a minute, when the stables are close to the shaft; considerably more air should be provided if the stables are placed at a point distant from the shaft.

Value of Alaska Coal is Overrated

After a careful investigation of the coal lands in Alaska, William Griffith, an experienced mining engineer of Scranton, Penn., says that the extravagant stories concerning the value of Alaska coal lands are much exaggerated.

Mr. Griffith declares that the bulk of Alaskan fuel is of an ordinary quality. He favors a sliding scale of royalties, according to the grade of the coal, and says: "Conservation without utilization is a wrong idea and a drag to progress." His estimate of the quantity of coal in Alaskan fields is given as 300,000,000 tons. As to what may be expected in the way of a yearly output, it is stated that 2,000,000 tons annually is a liberal estimate.

One other point of importance brought out by Mr. Griffith in his report, shows that in many parts of Alaska, timber is being rapidly exhausted for fuel because the coal cannot be developed. As to the value of the Alaska coalfields, assuming 2,000,000 tons as a liberal average annual output, Mr. Griffith states that at the high royalty of 50c. per ton there would be an annual value of about $1,000,000, which might continue for 100 years. At 4 per cent. the present worth of such an annuity is approximately $25,000,000, without considering the deductions usually made to cover the ordinary uncertainties of mining.

It is further stated that the building of railroads in Alaska means the introduction of labor-saving machinery, cheaper food and materials, more and cheaper labor, and a general amelioration of the stern conditions which now prevail. The introduction of such improvements will immediately be followed by an outflow of wealth far beyond our expectations, which will be wrought out from the abundance of low-grade ores or placers, and from the tailings or refuse from the rich diggings of the past years, which cannot now be profitably worked and are necessarily wasted. Mr. Griffith says that the prime necessity of Alaska, with respect to railroad construction, is the opportunity to utilize some of its dormant coal reserve.

All Alaska coal lands have been withdrawn from entry. The present plan of conservation, according to Mr. Griffith, is a wrong policy. In this connection he says: "Let our Congress enact new laws for the control of this question with full knowledge of the situation. If it is proposed to control the coal industry of Alaska through some sort of leasehold arrangement, let us provide a high per ton royalty for the relatively small quantity of high-grade coal we possess, and a lower rate for the medium- and low-grade coals; thus arranging the royalties on a sliding scale in some manner proportionate to the percentage of fixed carbon contained in the coal; or some similar plan which will force the conservation of the very important high-grade navy fuels for the higher uses of the district and the nation, to which they are adapted, thus in a measure compelling the mining of the lower-grade coals for the more ordinary local purposes necessary to the development of Alaska."

Inflammability of Shale Dust

BRITISH CORRESPONDENCE

At a general meeting of the Mining Institute of Scotland, in Edinburgh, Dec. 11, a paper was read by Robert W. Dron descriptive of the "Index-Beds in the Carboniferous Limestone Series of Scotland." This was followed by a paper on "Shale Dust and Coal Dust Tests at Broxburn," prepared jointly by William Clark, manager of the Broxburn mines, and Robert McLaren, H. M. inspector of mines. The authors explained that the term shale as used by them meant oil shale as distinguished from ordinary shale. They recalled that within recent years it has been thought by some that watering the dust in coal mines is not only an ineffective means of preventing an explosion, but that in many instances it destroys the roadways where the strata are of a soft material. In order that some other method having for its object the extinction of the flame from coal dust might, if possible, be adopted, they carried out a series of experiments. They were anxious to find out by experiment the inflammability or noninflammability of shale and shale-mine dusts in the presence of a firedamp explosion, and they demonstrated that:

(1) Shale-mine dust, even if it exists in large enough quantities, will not constitute a danger in mines, as it is not inflammable in the presence of a firedamp explosion, but will have rather the effect of retarding the flame.

(2) That it is possible to neutralize or destroy the power of coal dust to propagate an explosion by mixing with it equal proportions of a noninflammable dust, such as that got from spent shale or fireclay. Spent shale is preferable, being a waste product, and of a friable nature, which renders it easy to reduce to dust. It is also of low specific gravity, and is thus more freely mixable with coal dust.

A new weekly paper with an assured circulation of 30,000 has made its appearance at Essen, Germany. It is called the *Kruppsche Mitteilungen* and is distributed gratis among the employees of the great steel firm. It is printed on the company's own press and is mainly designed to be a substitute for the notices which used to be posted periodically at various points in the Krupp workshops.

COLLIERY·NOTES

As the result of a new ruling by the State mine inspector, all persons holding the position of mine foreman or fireboss in the mines of West Virginia, hereafter, must hold a certificate from the department of mines.

As a guide to safety where shots in mines are fired through the medium of a fuse, it may be stated that an ordinary fuse burns at the approximate speed of 1 ft. in 30 sec.; however, some margin of time should be allowed for variation from atmospheric or other causes.

The misnomer "safety" as applied to permitted explosives seems to have caused some users to imagine that these explosives are safe under all conditions. It cannot be too strongly impressed on the users of these "permitted" explosives that all that can be really claimed for them is that they are less dangerous than gunpowder, so far as the ignition of firedamp and coal dust is concerned. These explosives are absolutely dangerous unless used with certain definite precautions.

One authority on the subject of peat mining says: "It seems to me that many peat deposits are so located in near proximity to towns that it would be possible and practicable to erect an electric plant at the bog, using the peat as a fuel and converting it into electric current, which would be transmitted to the nearby towns. The peat could be used directly as a fuel, or in the production of gas in a gas producer." In North Carolina, a number of towns are situated close to deposits of good peat, and it is possible that such a plant could be made a profitable investment. There are towns in other States similarly situated that offer the same commercial advantages.

The damage caused to a shot-firing wire by thoughtless treatment on the part of a shot-firer in paying out or in taking up a cable, is certain to result in breaks, which are all the more troublesome because they may occur without apparent injury to the insulation and can then only be found by testing or carefully feeling along the line. One authority says that to pay out a cable properly, the end should be made fast to the fuse wires, the coil gripped by one hand and rotated clockwise (as though it were a wheel on a spindle) as far forward as the hand will take it. At the end of the forward movement the coil is seized at the point nearest the body by the other hand, which continues the motion, each hand alternately taking the other's position. As the cable falls to the ground, the operator should walk away from it —backward, if he can conveniently do so—and leave the line lying straight out before him.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. E. Spurr is at Tonopah, Nevada.

Pope Yeatman has returned to New York from Chile.

J. Parke Channing was at Cananea, Mexico, recently.

Franklin Leonard, Jr., of New York, was recently in Virginia City, Nevada.

Edmund Shaw, of El Paso, Texas, is in Mexico, rebuilding a cyanide plant.

Harry E. Kirk has returned to Cananea, Mexico, from a trip to the West Indies.

Robert H. Richards has just returned to Boston from a professional trip to New York.

Leon Dominian has left Mexico and expects to be in New York about the middle of April.

F. P. Morrell, of Cleveland, O., has been at Parral and in the Inde district in Mexico, examining mines.

Victor Rakowsky is spending a few days at French Lick Springs, Ind., and will leave for the Southwest shortly.

Jesse Scobey has been making an examination of the San Pedro Analco mine on the Santiago river, Jalisco, Mexico.

James D. Bryden has been appointed mine superintendent for the Cedar Hill Coal Company at Cedarhurst, Colorado.

Thomas H. Leggett, who has been in Colorado on professional business, is expected to return to New York this week.

Charles F. Shelby has changed his address from Cananea, Mexico, to "care of Cerro de Pasco Mining Company, La Fundicion, Peru."

C. W. Fuller, recently in Nevada, has accepted a position with the San Toy Mining Company at Santa Eulalia, Chihuahua, Mexico.

H. C. Wilmot has accepted the managership of the Commercial Mining Company at Rye Valley, Oregon. His Salt Lake office will be closed while he is so engaged.

Sir Alfred Keogh has been appointed rector of the Imperial College of Science and Technology, London, England, to succeed Dr. Henry T. Bovey, resigned.

E. A. Montgomery, president of the Sierra Madre Club of Los Angeles, Cal., has been in Washington for several weeks in the interest of the Mining Bureau bill now before Congress.

Edward Flynn, recently appointed inspector of mines for the Tennessee Coal, Iron and Railroad Company, is spending some time studying conditions in the coal mines of the Pittsburg district.

Dr. Edward D. Peters has been designated by the Board of Overseers of Harvard University as "Gordon McKay professor of metallurgy," in honor of the donor of the great endowment fund.

Donald F. Irvin has joined the engineering staff of the Vulture Mines Company, Vulture, Arizona. He is a graduate of the University of California and has had several years of practical experience.

Henry S. Reed, Jr., has resigned his position with La Gloria mines in Chihuahua, Mexico, to accept the appointment of engineer at the Tres Hermanos mines, Batopilas, Chihuahua, Mexico.

Harry S. Matthews, of Birmingham, who was recently elected vice-president of the Alabama Consolidated Coal and Iron Company, has assumed charge of affairs in Alabama for the company. In company with C. P. Ludwig, chief engineer, a complete tour of the properties of the company will be made. Guy R. Johnson, heretofore vice-president and general manager, will remain with the company in charge of the physical operations.

The old banking house of W. S. McCornick & Co., of Salt Lake City, Utah, which has been connected with many important mining transactions since 1873, when it first began business, was incorporated as a joint-stock bank on April 1. The incorporators include C. M. MacNeil, president, and D. C. Jackling, general manager of the Utah Copper Company; Spencer Penrose of the same company, Charles Hayden, of New York. W. S. McCornick will be president and D. C. Jackling vice-president of the bank.

W. A. Green, heretofore auditor and treasurer of the Southern district of the Republic Iron and Steel Company, has been appointed by President T. W. Guthrie manager of the Southern district, with headquarters in Birmingham, Ala. Mr. Green will have full charge of the work of the company in the Southern district and the local officials will be responsible directly to him for the operations of their respective departments. Mr. Green has announced the following appointments: J. E. Johnson, Jr., general superintendent Thomas division; W. I. Kluttz, assistant general superintendent Thomas division; J. W. Penhallgon, general superintendent ore mines and quarries; F. G. Morris, general superintendent coal mines; R. L. Cross, purchasing agent; W. H. Johnson, traffic manager.

OBITUARY

Harold E. Sherman died in New York, April 3, aged 53 years. He was born in New York, but went to Nova Scotia when a young man and was connected with the coal-mining industry there for a number of years.

Col. Dudley Evans, who died in New York, March 27, aged 72 years, was best known as president of Wells, Fargo & Co. He had also been for a number of years treasurer of the Batopilas Mining Company, of Mexico.

Dr. Franklin R. Carpenter died suddenly April 1, in Chicago, where he was temporarily on business. He was widely known as an expert on many smelting questions. Dr. Carpenter was born at Parkersburg, W. Va., in 1848, and graduated from the University of Ohio, at Athens. Immediately after graduating he went to Colorado, where he at first engaged in teaching. He soon made a reputation for himself and was twice elected State superintendent of education, but never held the position on account of political complications. This experience ended his political career and he turned his attention to mining. In 1886 he went to the Black hills in South Dakota, and commenced to investigate the mining and smelting operations then in use there. Soon after he was appointed director and professor in the State School of Mines at Rapid City, where he remained for several years, at the same time continuing his work in smelting. Finally he gave up his connection with the school and went to Deadwood, where he built and operated the Deadwood & Delaware Smelting Works, the first pyritic smelting plant in the country run on a commercial scale. About 1900 he returned to Colorado, making his home in Denver. He designed and built the Clear Creek Mining and Reduction Works at Golden, which were generally known as the Carpenter works. By this time he had acquired a high reputation as an expert and was consulting engineer for a number of companies in Colorado and South Dakota, while his advice was frequently asked on smelting questions. He wrote several books and was a frequent contributor to the technical press and to the *Transactions* of the American Institute of Mining Engineers. He leaves a widow and five children. Aside from his mining work, Dr. Carpenter was a student of genealogy, and it is said that few men were better posted on family history.

SOCIETIES and TECHNICAL SCHOOLS

Scranton Mining Institute—The season work was closed by the annual dinner, held in Scranton, Penn., April 2. It was attended by many prominent mining men and was a successful occasion.

North Dakota School of Mines—This institution is installing a briquetting plant for lignite, with a capacity of two tons per hour and a complete gas plant of the latest type with automatic recording apparatus for temperatures, pressures, etc., together with a complete laboratory for coal and gas analysis and testing.

EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on Important Events From Many Important Mining Centers of the World

San Francisco

April 2—The conditions affecting the supply of water for mining during the summer have happily changed within the past few weeks. The snow supply in the mountains had been fast melting, owing to warm weather, but recent storms added several feet to the snow storage in the Sierras and this is not likely to be melted by rains so late in the season. The miners therefor think they are sure of a good water supply this coming season.

The mines and smelting plant of the Afterthought Copper Company at Ingot, east of Redding, Shasta county, are not advantageously situated as to railroad facilities. When the mine and plant were worked they had to haul everything by team from the terminus of the Terry railroad over very bad roads, and in winter these roads were impassable. It was decided to quit work until a piece of railroad could be built to connect with a main line. Necessary financing has been done and this branch road will be built and soon work will be resumed at these mines.

Ore reserves of the First National Copper Company in Shasta county, Jan. 1, are announced as 1,134,140 tons of developed ore and 791,630 tons of probable ore. During January, 981,278 lb. of copper were produced and net profits amounted to approximately $30,000. The company produced in 1909, 11,569,314 lb. of copper, and is figured to the earning at the present time 60c. per share net.

Bakersfield capitalists are arranging to purchase 20 mining claims in the White river district, Tulare county, near the Josephine mine. The ore in that section is in large bodies, but is of low grade. Large mills will be required. A 20-stamp mill will be first used during development work. The 10-stamp mill of the Josephine mine will shortly be started up. Not much development of note has ever been done in the White river district.

Goldfield

April 1—A public letter signed by H. C. Brougher, a director, and one of the heaviest individual stockholders of the Tonopah-Belmont Development Company, charges the directors of that corporation with mismanagement of the company's mine and mill, and the stockholders are asked to send proxies that a new board may be elected at the annual meeting of the stockholders to be held at Camden, N. J., May 3. It appears that several of the directors are serving the Tonopah & Goldfield railroad in like capacity, and it is charged that the best interests of the mining company have been sacrificed for the benefit of the railroad. Three years ago a 60-stamp mill was erected at Millers, 13 miles from Tonopah, on the Tonopah & Goldfield Railroad, and a high transportation charge placed on Tonopah ores.

Denver

April 3—The Cripple Creek output for March, as reported by the smelteries, valley and local mills, is given at 59,000 tons having a gross value of $1,358,400, the average value being $23 per ton. Two dividends were paid: the Doctor-Jack Pot, $15,000; March 1; and the El Paso, $24,000, April 1. The camp generally is in a most prosperous condition, and all the companies and claim owners are getting busy in anticipation of the boom that is expected on the completion of the deep drainage tunnel in seven to nine months from now. That there are good grounds for this expectation no one will dispute, as evidenced by the numerous strikes of rich ore that have been made in the deepest levels of so many of the big mines during the last year or two.

The Newhouse tunnel company has taken over the Gunnell mine, which as far back as 1880 ranked third among Gilpin county mines, with an estimated yield of $2,500,000 up to that date. It was discovered by H. Gunnell in 1859, and like most of the mines in that camp the surface oxidized ores were enormously rich, and after the owners had taken about half a million dollars of gold from it, it was sold in 1864 to a New York company, the Central Gold Mining Company, which paid $80,000 for 200 ft. on the vein. The Gunnell Gold Company, Gen. Fitz John Porter, agent, paid $300,000 for 480 ft. In 1877 gold bullion worth $15,000 to $16,000 was shipped to Denver every month. The mine has been closed for many years. The vein held good in width as depth was gained, and it is known that there is plenty of good ore in the deepest workings, and it will now probably be unwatered and worked from the Newhouse tunnel at great depth. The breast of the Newhouse tunnel, however, has not been advanced since last October.

At Leadville the snow is going off with great rapidity, and as the spring is unusually early, prospectors are already starting for the hills, particularly into what is now called the gold belt, from South Evans to the other side of the Mosquito range, Here, too, the St. Louis, Ollie Reed, Gold Basin, Little Ella, Blanche, Cleveland and Valley are regularly sending out their production of gold-bearing ore, and that, together with the strike of silver-lead-gold ore made by George Campion, leasing on the Blanche, has encouraged prospectors and workers in that part of the district. The Yak tunnel is being pushed ahead, the breast being now in Maxy territory. The Resurrection gold mine, owned by D. H. Moffat, which is under lease to the Yak company, is being rapidly drained, and it is expected will be completely unwatered in about a month. It is estimated that when all the ground opened for work by this tunnel in Big and South Evans gulches is ready for leasing, that employment will be given to 700 men.

Butte

April 3—At the special meeting of the stockholders of the Anaconda Copper Mining Company, at Anaconda, March 23, 1,026,621 shares out of the total of 1,200,000 shares were represented by President B. B. Thayer who held the proxies. The capitalization was increased to 6,000,000 shares of $25 par value. The report of James F. Kemp and Herman A. Keller on the properties of the various Butte companies, which the Anaconda company proposes to absorb, was submitted. By a unanimous vote the directors were authorized to offer to the several affiliated companies in Butte, in exchange for all property of those companies, shares of stock in the Anaconda Company as published in the JOURNAL of April 2, 1910. Of the companies which the Anaconda company proposes to buy out, the Boston & Montana company with its Mountain View, Leonard Pennsylvania, East and West Colusa and Badger State mines and its smeltery at Great Falls is generally conceded to be the most valuable. The North Butte company is the one notable absentee from the proposed consolidation, and the exact cause is a matter of guess work, in Butte at least. There have been rumors to the effect that the laws of Minnesota, under which the company was incorporated, necessitated the votes of all the stockholders before the entire assets of the company could be sold and that the requisite votes could not be obtained. There have also been rumors to the effect that the physical valuation of the property caused its rejection by those behind the

merger, but of the two theories the former is generally accepted as the more probable. It will be noted that in the plan as outlined at the stockholders' meeting the Anaconda company will become the operating company and the old operating companies will become the holders of Anaconda stock.

Following the meeting of the Anaconda Copper Company the Boston & Montana company held a stockholders' meeting on the 26. Out of a total of 150,000 shares, 149,550 were represented and the offer of the Anaconda company to purchase all the property and assets of the Boston & Montana Company was accepted and the directors authorized to make the sale for 1,200,000 shares of Anaconda stock. All of the Amalgamated's subsidiary companies will hold stockholders' meetings within the next month to act on the Anaconda company's offer.

At the special stockholders' meeting of the Washoe Copper Company held March 29, the directors were authorized to accept the proposal of the Anaconda Copper Company which offered 380,000 shares of Anaconda stock of the Washoe company's property.

The Butte & Superior Copper Company has acquired control of the North Butte Extension Mining Company, which owns the Black Crow group of claims, adjoining the Butte & Superior property on the east. An option has also been taken on the Daniel Quilp claim which lies between the Butte & Superior and the Butte & Milwaukee ground, and the Narrow Gage claims have been purchased. This gives the Butte & Superior about 150 acres of contiguous mining ground. By the agreement between the Butte & Superior and the North Butte Extension the former acquires 800,000 shares of the latter's stock and in return will pay off the current indebtedness of the North Butte Extension and also run a crosscut from the Butte & Superior Black Rock shaft at the 1600-ft. level to the North Butte Extension's Black Crow shaft. The Black Crow shaft is down 600 ft. and when the crosscut has reached a point under the shaft a raise will be run to connect with it.

Salt Lake City

April 1—The Utah Ore Sampling Company at the present time is sampling a large part of the custom ore which comes into the Salt Lake market from Idaho, Montana, Oregon, Nevada and Utah. It is operating mills at Murray, Silver City and Sandy. This company has succeeded to the interests of the Taylor-Brunton Ore Sampling Company in Utah and of the Pioneer Ore Sampling Company, and is now the largest independent company engaged in the business in this section. Ernest R. Woolley is president and Arthur W. Gates, manager. This company reports that no marked change has occurred in the Salt Lake ore market. There has been a gradual increase in ore shipments owing to the somewhat improved condition of the roads. During the past week some ore was shipped from Alta.

A recurrence of the difficulties between the farmers and smelters seems possible at the present time. The farmers' committee threatens to reopen court proceedings and has, through its lawyers, sent a letter to the American Smelting and Refining Company, alleging that the company's plant at Murray has violated the court decree requiring that the smoke and fumes pass through a flue and settling chamber instead of directly into the stack. The letter further states that, on visits of inspection, the smeltery was found to be operating twice in accordance with the decree, and fifteen times contrary to it. Damage to animals and crops is charged. The letter concludes that unless there is a strict compliance with the decree, steps will be taken for its enforcement. The committee has arranged to make visits to the plants twice a month during the growing season, and once a month during the rest of the year.

The Godfrey case was made a test for the smeltery-smoke cases and was bitterly fought through the Federal court here, then in the Circuit Court of Appeals in St. Louis, and finally affirmed by the Supreme Court of the United States.

The farmers in the neighborhood of Garfield are also inclined to be uneasy. An action was filed in the district court on March 21 by Walter Steadman against the Garfield Smelting Company for $13,720. Mr. Steadman represents thirteen other farmers beside himself, and claims damage done by the smeltery fumes to vegetation and livestock during 1908 and 1909.

The United States company at Midvale is successfully using its baghouse and zinc oxide treatment of fumes, and no complaints have been made regarding its operation.

The damage to the Yampa smeltery at Bingham caused by a cloudburst late last year has been repaired. This places the Yampa again in its normal condition.

The taking of testimony in the case of the Silver King Consolidated vs. the Silver King Coalition was resumed on March 28. The plaintiff is now presenting its side of the case. During the week miners who worked in the Parson's stope testified as to the quality of the ore, and the size and number of the sets in different parts of the stope where they worked.

It is reported that the contract for grading the Bingham & Garfield Railroad has been let to the Utah Construction Company, of Salt Lake. The proposed line will be over 17 miles long and will extend from the mines of the Utah Copper Company at Bingham, to the concentrating mills at Garfield, and from there to the smeltery.

Deadwood, S. Dak.

April 2—The labor situation at the Homestake mine has reached a normal condition. New men have been brought in from Joplin, Mo., Cripple Creek, Butte and Michigan points. About 1500 miners and underground men are now employed. William O'Brien, mine superintendent, states that the new men do about one-seventh more work than the old men. The new shovelers average about 13 tons of ore per man each 8-hour shift. There are about 800 Slavonian laborers still left in Lead who refused to sign up the card demanded by the company. The Western Federation of Labor practically admits defeat in the Black hills. The last attempt that will be made by them is to win the spring election in the city of Lead. The company is unwatering below the 1100-ft. level which was allowed to fill when the trouble began. The slimes plant at Deadwood is to be enlarged to take care of additional slimes.

Sufficient men have been found to take the place of the 50 per cent. that refused to go back at the Mogul and Golden Reward mines and mills and both companies have resumed milling. All of the mines in the Bald Mountain district will be working normally soon. Hereafter American labor will predominate.

Ely, Nev.

April 2—The Boston-Ely Company is continuing important development work, situated as it is outside of the recognized porphyry area of the camp. Operations at present are confined to sinking a winze from the 1120-ft. level of the Emma shaft. The winze was started at a point 200-ft. north of the shaft and is on the contact between the "jasperoid" and the carbonate ore. The present depth is 50 ft. and it will have to go 50 or 60 ft. deeper to reach the level of the bottom of the shaft, which appears to be near the ground-water level. The shaft itself is in hard ground and as the contact is pitching away from it the company determined upon the winze as the most suitable means of preliminary development.

The Success Mines Company, at the head of Duck creek, 12 miles due east of Ely, is working a dozen or more men. This company, while only recently incorporated, has been working for several years. D. C. McDonald, of Ely, is manager. The development consists of a 300-ft. shaft and several hundred feet of drifts. The ore is high in iron and carries gold, silver and lead. Several cars of ore were shipped to Salt Lake City last year and it is expected that shipments will be resumed this season as soon as the roads are in condition. The Success mine is looked upon as one of the main induce-

ments for the erection of a lead smeltery in Steptoe valley.

Between 1300 and 1400 men are at present on the payroll of the Steptoe Valley Smelting and Mining Company at McGill. The full battery of 16 McDougall roasters is now kept busy on the concentrates from the mill and calcines are being turned out a little faster than the reverberatory furnaces can handle them. If there is a weak spot in the company's system it lies in the furnace building. The shutting down for relining keeps one of the furnaces out of commission practically all the time, and the present output of concentrates is a little more than the other three can handle. Construction of a fifth furnace, started last fall, will quite likely be completed this spring. The converter plant shuts down every other Sunday, so it is evident that this portion of the plant has the situation well in hand. Installation of Waddell classifiers in all parts of the mill, and the feeding of dry ore from the bins directly to the rolls are two innovations which helped to bring the plant up to its present capacity. All water for the eight sections of the mill is brought by gravity alone through a 34-in. pipe from the reservoirs on Duck creek. The company, however, has an auxiliary plant in Steptoe valley below the works should this be needed.

Scranton, Penn

April 4—The large washery of the Mount Hope Coal Company, near St. Clair, was destroyed by fire March 31, causing a loss of over $10,000. The fire is supposed to have been incendiary. It was a serious loss, for not only was the washery destroyed, but the accounts of the company, maps and working plans which were in an adjacent office were also destroyed. While the fire was in progress a tremendous explosion occured when the supply house took fire. There were 1200 lb. of blasting powder stored in the place. The explosion caused the wreck of the boiler house and the hoisting machinery. No lives were lost.

All the mines throughout the anthracite region were idle on April 1 to commemorate the concession of the eight-hour day in the bituminous regions. The majority of the washeries worked, however. Many of the anthracite miners were not at all pleased to have to remain idle to celebrate an event which in no way concerns them. There were a number of mass meetings announced, but they were sparsely attended.

The Harleigh colliery of the Black Creek Coal Company, near Hazleton, has suspended stripping temporarily as the operations are not so far advanced that coal can be regularly mined. Coal has been reached, but it is mined only in such quantities as are immediately needed around the mines. Before it can be mined for the market a plane and haulage apparatus must be built and the construction of these will take at least six weeks. The Markles are said to be negotiating for the mine.

Indianapolis

April 3—The 21,000 coal miners in Indiana who are taking part in the general suspension of mine operation, will probably resume work at an early day, according to information given out from the headquarters of the United Mine Workers' Association in this city. The Indiana Operators' Association meets at Terre Haute, April 6, and it is understood that the operators have agreed to meet the demands of the men. A definite date for the resumption of mine operation will not be fixed until the joint conference is over. Coal shipments to points within and without the State during the past week have been extremely heavy. This condition has existed for the past month, but the near approach to the time of the predicted suspension the shipments increased materially. The equipment of the roads was hardly sufficient to handle the shipments—all the empty gondolas were rushed to division points and pressed into service. These conditions have been changed in a day's time. The Indiana mines were worked steadily and to their fullest capacity for six weeks, but notwithstanding all this precaution, a number of large consumers have not a week's supply of fuel ahead. The mines are idle and the railroads are cleaning up the remnants of stock at the mines.

Cobalt

April 3—The ear'y breakup of winter which is practically unprecedented, has made the roads into the outlying districts impassable. In consequence, there are large quantities of supplies that it will be impossible to move. It is stated that there are stalled at Charlton 50 cars of provisions, supplies and machinery.

The Gowganda district has made a very favorable impression, and public confidence in its future seems to be restored. The Millerette was the largest shipper, sending out 198 tons. The Reeves-Dobie shipped 62 tons; the Boyd-Gordon, 30 tons; the Miller Lake-O'Brien, 11 tons, while the Welsh and the Burke-Remey each made a small sample shipment of between one and two tons. The Elk Lake camp has also contributed, the Lucky Godfrey having shipped 20 tons, the first shipment from the district.

Difficulty has been experienced in the Porcupine district on account of the early breakup. The companies putting in machinery have been rushing the work and practically all the supplies are now over the roads. The people who purchased the Milson-Edwards claims sent up a special train from Cobalt with 15 teams to rush supplies in. The Timmins has shipped a car of ore to New Jersey to have a mill-test made. The work so far on the different properties has been encouraging. The Timmins has run a crosscut from one of the shafts to the main vein at 50 ft. and found free gold. At the Foley-O'Brien property there is also free gold at the bottom of the shaft. On the Wilson property no sinking has as yet been done, but shots were put in all over the face of the outcrop and with one or two exceptions, all showed gold. There will be plants working on seven properties this summer. At present the great need is a summer road and the Government has been petitioned to build one.

Toronto

April 4—Applications for provincial mining licenses this year were unusually numerous. All licenses expire at the end of March and the rush to take out licenses for the season exceeds anything hitherto known. The number will probably be between 4000 and 5000.

Excitement has been caused by the reported discovery of commercial coal on the Metagami river, 60 miles north of the Grand Trunk Pacific Railway, west of Cochrane. About 20 square miles of territory along the river have been staked, each claim comprising a square mile. The permit to prospect for coal, however, does not include other valuable minerals. No definite information with regard to these finds has been received by the Department of Mines, and in official circles there is a disposition to accept the report with a good deal of reserve. It has been known for some time that lignite occurs in that region, outcrops having been discovered in 1903 on the banks of several rivers flowing northward on the Hudson Bay slope. The lignite then found was of good quality but there was no evidence of its occurrence in payable quantities. The government, in view of the extensive staking, has decided to send an expert to the locality as soon as the ice breaks up to investigate and report upon actual conditions. In the meantime, numerous prospecting parties are going into the district.

Joseph W. Boyle, of Dawson, Yukon Territory, president of the Canadian Klondike Mining Company, states that the company has recently purchased the largest placer gold-mining dredge in existence. The machine has 15-cu.ft buckets. Over 435,000 ft. of timber was required for its construction, which was purchased in Vancouver. The lumber and machinery were forwarded to Dawson and the dredge put together there. Mr. Boyle says that by the new method of thawing adopted, the dredging season in the Yukon has been considerably lengthened. His company was last year able to begin making about 195 days and hopes this year to do still better.

THE MINING NEWS

Reports of New Enterprises, New Machinery, Installations, Development Work and Property Transfers The Current History of Mining

Alaska

The first news from the placer strike, 125 miles up Taku river is from nine Juneau prospectors, who state that coarse gold is in the gravel all along the creek but the gravel beds do not freeze and the water has caused all efforts to sink to bedrock to be abandoned.

Golden Gate—This Sitka company is making preparations to add five more stamps to its mill this season.

Archangel—This mine, Willow creek district, Knik, has been bonded by Frank Watson, of Spokane, Wash., and development work will be started.

Birner's Bay—This Juneau company's property has been sold to the International Trust Company, of Boston. Active work will be started this spring.

Ebner—This mine is to be operated by a new company. A larger mill will be built. H. F. Tripp is in charge.

Alaska Treasure—Development at the mine on Douglas Island is being pushed. A crosscut is being driven 3300 ft. W. H. Priestley, Jr., is superintendent.

Arizona

Cochise County

Commonwealth—The new plant at Pearce was burned causing a loss of $150,000. The mill was also to treat ore from Courtland. The mill will be rebuilt.

Copper Queen—Since the completion of the trolley system on the 1400 level of the Lowell, all the ore is being hoisted at the Sacramento shaft. The new drift from the Lowell winze on the 1500 level has run into some good sulphide ore along the north end line of the Hoatson property of the Superior & Pittsburg. Work is being done on the 400-level haulage system. The Uncle Sam shaft is producing a small amount of high-grade oxide ore both from the N level and the B level. The territory both above and below the body of chalcopyrite and bornite ore in the Holbrook 400 haulage drift, which was run into some time ago, has been prospected by drifts on the 300 and 500 levels. The drift on the 300 level is beyond the point on the 400 where the ore exists and has exposed only a small stringer of ore. The drift on the 500 level below the 400 ore has also been disappointing as it has shown up no ore. The new drift on the 1100 level at the bottom of the Gardner winze has just entered low-grade sulphide ore.

Shattuck-Arizona—Shattuck continues regular shipments from the 600 level.

Denn-Arizona—A rich strike of oxide ore is reported at the Denn property.

Calumet & Arizona—Repair work continues in the Oliver shaft. There are three crews working each shift and three shifts per day. All development work from the Irish Mag shaft has been temporarily suspended until the repairs at the Oliver have been completed. Only ore is being hoisted.

Superior & Pittsburg—The drift on the 1500 Junction in which ore was recently discovered has been advanced through the ore and entered waste. The extent of the ore in this direction is 70 ft. Another crosscut has been started. At the Briggs shaft on the 1200 level a drift has been run south.

Gila County

Inspiration—The company has three churn drills working west of the Joe Bush shaft. A raise put up from the 400-ft. level of the Joe Bush shaft is 300 ft. high and at this hight is near the surface. This raise is the first of a series by which the ore will be mined by the "mill-hole" method.

Superior & Boston—The winze from the 400-ft. level of the Gardner workings is 35 ft. deep. Drifting east and west along the vein on the 400-ft. level is progressing and the breasts of both drifts are in ore. Sinking of the McGaw shaft and the Great Eastern winze is nearing the seventh level.

Boston-Miami—The ninth and tenth churn-drill holes put down are respectively 800 and 900 ft. deep. The former hole is located in the granite-porphyry area and is the deepest hole yet drilled in the district. One of the churn drills recently made a record of 84 ft. in 12 hours. F. W. Hoar is superintendent.

Graham County

Shannon—There have been important developments in the mine at depth and costs have been reduced. The ore treated averages 57 lb. of copper to the ton.

Mohave County

Keystone—This Mineral Park property is under bond. New equipment is being installed. S. R. Porter is in charge.

Oneida—A shaft is being sunk by the Venture Exploration Company of Duluth, J. P. Hamilton, superintendent.

Dandy—This mine, Weaver district, has been bonded to J. P. Hutchinson, of Chicago and work will be undertaken.

Fairview—This zinc property sold to the White company, of Lima, O., is being developed in charge of D. S. Richards, of Chloride.

Frisco Mines and Power Company—This company is planning to install a treatment plant for free-milling ore. New York office, 257 Broadway.

Gold Hill—This new company will place a mill soon. E. B. Van Dieman, Kingman, is manager.

Yavapai County

United Verde Extension—The reported strike at 800 ft. on the Little Daisy is attracting much attention. The company is developing the extent of the orebody. J. J. Fisher is manager.

Venezia—Governor R. E. Sloan and J. B. Tomlinson, have decided to erect a 10-stamp mill on the property in Crook Cañon.

California

Amador County

Kennedy—The main orebody at the 3300 level holds out in size and value. The February yield was $60,000.

Treadwell—This mine, Sutter creek, is to be under charge of Joseph Oneto.

Argonaut—What is believed to be a new orebody has been struck on the 3300 level of this mine at Jackson.

Butte County

White & Hunter—This mine at Oregon City is being reopened.

Russell—Richard Phillips has bonded the mine at Hurleton and will prospect it.

Kern County

In the Randsburg district ore is being milled from the Corona mine, owned by the Lacrosse company of Pasadena; the Houser mine is also milling ore. The Sydney group is having ore treated at the Phœnix mill, Johannesburg.

Mono County

Posey Cañon—H. B. Skewes and others have taken a lease on this gravel mine.

Shasta County

In the Harrison Gulch district the Midas company has cut the Gold Hill vein 700 ft. below the surface, which has previously been worked by drifting on the mountain side. The Victor company has ordered a new mill.

First National Copper—Thompson, Towle & Co., say: "It is becoming evident that stockholders will have to stand another assessment. Two years ago the stockholders contributed $1,500,000, which was then stated sufficient to meet all con-

struction charges, etc. The company again came to grief a year ago, when the management attempted to raise $1,000,000 by an issue of convertible bonds. It did not succeed, but pledged a portion of these bonds as collateral for $375,000 of notes which fall due April 15, 1910, and $375,000 of bonds maturing July 1, 1910, so that $750,000 of new money will have to be provided some way. While the company has been showing net earnings of $20,000 to $30,000 per month, it has needed this money for working capital, and it is not available for other purposes.

Michigan—This group of copper claims adjoining the Bully Hill has been bought by the Bully Cave Company, E. J. McLaggan, superintendent.

Hornet—The Mountain Copper Company is installing a plant for precipitating copper from the mine water.

SIERRA COUNTY

Neocene—Preparations are being made on a large scale at this mine, Scales, for extensive work hydraulicking this season.

Irelan—On this group at Alleghany, George Hegarty only has a few men at work this winter but extensive development will be carried on this spring.

General Sherman—This mine at Alleghany has been bonded to Daniel McGonigal and work will now be resumed. There are three tunnels on the mine, one 700 ft. long.

Sierra Buttes—A strike has been made in the No. 6 tunnel on what is supposed to be the Whiskey vein which proved so rich above. Jay C. Folsom is superintendent.

TRINITY COUNTY

Trinity River Dredging Company—This company, holding an option on 900 acres of dredging ground above Lewiston, will install a dredge this spring. A water right of 1000 in. has been purchased.

Headlight—The second payment of $40,000 has been made on this mine at Carrville. The mine is to be worked on a large scale. D. W. Shanks is manager. A 40-stamp mill with cyanide plant is being installed.

TUOLUMNE COUNTY

Karnac—This company near Jamestown has installed gasolene engine at the mill. There is a 20-inch vein in the bottom of the Hancock claim.

Tarantula—The newly installed machinery at this mine is now in complete operation.

Columbus and Cleveland—These two mines at Cherokee have been bonded.

Colorado

LAKE COUNTY—LEADVILLE

Gold Basin—This property is shipping about six carloads of ore per month, some of it carrying as high as 11 oz. gold to the ton, and 38 oz. silver, the average, however, being 1 oz. of gold and 8 oz. of silver.

New Monarch—The output from the Cleveland and Vinnie shafts of this company is about 75 tons of ore per diem.

SAN JUAN DISTRICT

High-grade ore has been discovered on the Pandora claim, Telluride, by Lessee Carter. The Japan-Flora has recently shipped the highest grade of silver ore which has been produced in Telluride county in recent years.

Atlas—This property at Sneffels is carrying on development work. Ore of a milling grade has been opened on the Klondike lode from the San Pedro tunnel. The Atlas crosscut tunnel will reach this orebody by midsummer. Recent developments in a northwesterly direction along the Atlas vein have been of a favorable character. It is expected that the property will be on a paying basis by the end of the year. Fred Carroll is manager.

Revenue—The tunnel at Ouray has recently opened large orebodies of a higher grade than has been mined formerly. The property has been taken over from the leasees and extensive work is planned for the ensuing year.

Silver Ledge—The 200-ton mill has just been completed, and started operations. It is equipped with Blake crushers and rolls, two chilian mills, and 20 Wilfley tables, with Richard classifiers and Callow tanks. The ore is a silver-lead-zinc sulphide, and there are large bodies of it in this mine, which was a former dividend-payer, but closed owing to the last slump in the market. The manager is Karl A. Krumpfer.

TELLER COUNTY—CRIPPLE CREEK

Cresson—This mine is increasing its production. The output for March was about 2500 tons. At the 1000-ft. level it is said that a large body of ore is being mined that averages $25 per ton from wall to wall. Richard Roelofs is manager.

Pharmacist—This mine is being operated by four sets of lessees. It is expected this year to double the production of 1909, which was $41,000.

Stratton's Independence—Results for February: Production, 2140 tons averaging 26 dwt. per ton. Dump ore milled, 5300 tons; net profit, $10,350.

Idaho

CŒUR D'ALENE DISTRICT

Bunker Hill & Sullivan—To settle the long-standing litigation between this company and the Federal company, the latter has offered to turn over the Last Chance lead-silver mine in exchange for 27,000 shares of Bunker Hill stock, valued at about $1,400,000. The offer will probably be accepted as the heaviest stockholders in Bunker Hill & Sullivan have signified their approbation of the plan. The conflict was over areas of mining ground that overlapped.

Jack Waite—The third payment, $40,000, has been made and the final payment will be made in March, 1911. The property was bonded for $150,000.

Orofino—Patrick Burke has made his final payment under the bond on this property, the total consideration being $75,000. With lead-silver ore in sight to run a mill for a year, the company has decided to erect a 100-ton concentrator.

CUSTER COUNTY

Sunbeam Consolidated—This property, a few miles from Custer, is installing a hydroelectric plant. C. E. Gable is in charge. The ore is free-milling gold. The property is developed to 400 ft., and carries free-milling gold ore which is being treated in a 75-ton mill, using plates and the Monadnock mill. With the installation of water power, the operations of the property will be largely increased.

IDAHO COUNTY

South Fork—Wilbur D. Greenough, of Spokane, has taken a bond for $112,000 on the three-quarters interest in this gold mine between Golden and Elk City.

Indiana

GIBSON COUNTY

Ayrshire—The company has suspended work on the coke ovens which it is erecting near the mines. The ovens will not be completed until assurance of a steady production from the mines is obtained.

PIKE COUNTY

The representatives of the leading oil companies in this field have been placed under arrest charged with violating the statute concerning the waste of natural gas. The issue is regarded with concern.

The directors and stockholders of the Paloka River Coal and Coke Company are suing the Binghamton Trust Company to recover $300,000 damages because of failure to sell the Hartwell mines and 2400 acres of coal land after a purchaser was secured. The Hartwell mines are among the best equipped mines in the State. Electric motors are used to transport the coal to the main shaft, and electric lights are used in the mine. The mine property is in the hands of the trust company as receiver and the old company wants to get possession of the mines, since the receiver failed to unload the property.

SULLIVAN COUNTY

Alliance—The company, at Sullivan, will take advantage of the suspension to improve the Caledonia mine. The mine will be equipped with electric haulage, electric lights, telephones and other improvements.

Kentucky

The Berwind-White Coal Mining Company, it is stated, has bought about 100,000 acres, lying along the Tug fork of Sandy, near the Virginia line. A large part of the property is coal land, an extension of the Pocahontas field. It can be reached by a short branch from the Norfolk & Western. The plans of the purchaser are not announced.

Michigan

Copper

Houghton—Drill operations, under the supervision of Dr. L. L. Hubbard, have been started to expose the Superior lode.

Lake—The crosscut from the 6th level has reached the lode; this crosscut has been extended 230 ft. from the shaft. At the 5th level a crosscut was driven across the foot-wall lode and found it to be about 20 ft. wide, with about 10 ft. of it well charged with copper.

Mass—E. W. Walker, consulting mining engineer, of Detroit, is at this property to make an examination.

Michigan—The company is continuing exploratory work on the Bee tract both by drilling and underground. Drifting from the bottom of the old shaft on this tract has encountered encouraging ground.

Cherokee—This company has been organized under Michigan laws with a capitalization of 100,000 shares, par value $25, to develop land in sections 2 and 3, 51-37, known as the Penn.

Mohawk—No. 6 shaft is down to the second level and the crosscut to the lode is under way. Drifts north and south from the first level have been extended 75 ft. with the formation in the north drift a little the better.

Bohemia—The first drill is down 300 ft. and is believed to be in proximity to the No. 1 Adventure lode.

Winona—The stamp mill, being erected jointly by this and the King Philip company, has been inclosed and the erection of the stamping machinery will soon be underway. This mill will contain two heads with a capacity of about 1500 tons daily and will be ready in August.

Victoria—The new shaft on this property going down 3500 ft. east of the present producing shaft is down 125 ft. The temporary surface equipment has been completed and greater progress can now be made in sinking. Previous to the starting of this shaft drilling was done at this point and a very encouraging core taken. The producing shaft is bottomed at the 22d level and is sending about 500 tons daily to the mill. Conditions underground remain unchanged with the exception of a comparatively rich shoot which was opened at the 18th level by a crosscut across the formation toward the footwall.

Missouri

A project for a lead-smelting plant at Webb City, promoted by George W. Moore, has been given a public bonus of $10,000 and a site.

Montana

Broadwater County

Calumet & Corbin—The company which is operating the Minnesota mine in Jefferson county has recently acquired the Mammoth group of quartz claims, comprising 140 acres, in the Radersburg district. The shaft on the Mammoth claim is down 75 feet.

Keating—At a directors' meeting, J. M. Hodgson, of Houghton, Mich., was elected to fill the vacancy on the board of directors caused by the death of R. B. Dear, of Duluth. The management states that the control of a majority of the company's stock has been acquired by the Radersburg Consolidated Mining Company, a company recently organized under the laws of South Dakota. The company was organized as a holding company and also controls the Manhattan-California Gold Mining Company, operating near Placerville, California.

Butte District

The March output of Butte was about 24,000,000 lb, which is 5,000,000 to 6,000,000 lb. below normal. Butte Coalition produced nearly 1,000,000 lb. more than North Butte.

Butte & Ballaklava—In the west drift on the 800-ft. level, the management states that 2 ft. of copper glance have recently been encountered, the vein itself being about 9 ft. wide and all ore. In the east drift on the 800-ft. level, 11 ft. of ore is shown, which averages 10 per cent. copper. The company has recently issued a financial statement showing its condition Jan. 1. The mine and equipment is valued at $2,291,213, and the cash and money due from stock which has been allotted, is $215,552. Practically the only liability is for its capital stock of $2,500,000.

Butte Central—The claims against the old Butte Central and Boston Copper Company are now being paid off and it is understood that the title to the Ophir mine, now held by a trustee, representing the creditors, will be transferred to the new Butte Central Copper Company and that the work of unwatering the shaft, preliminary to further development work on the property will be begun soon.

Poser—On this mine the property of W. A. Clark and adjoining his Elm Orlu on the west, a shaft has been sunk over 500 ft. at which depth copper ore has been mined. On the 300-ft. level the values are principally silver.

Davis-Daly—The company has $80,000 cash in its treasury and is not expending over $8000 per month on development, keeping its expenditures down to the lowest possible figure. Within the next month the crosscut on the 1800-ft. level should cut the main vein, which was 25 to 30 ft. wide on the upper levels.

Butte & Superior—The hoist which was at the Colonel Sellers mine of the Butte & Milwaukee is being moved to the Black Rock, where it will be used to lower timbers and supplies through the pump shaft. The management states that the work of constructing the concentrator will be begun in April.

Jefferson County

Boston & Corbin—On the 700-ft. level 2 ft. of bornite has been struck. The strike was made at a point 200 ft. nearer the shaft than ore has been found on any of the other levels.

Robert Emmet—This company, Corbin, has decided to build a concentrator this spring.

Lincoln County

C. E. Lurgeris, of Libby, is planning the installation of a cyanide plant 35 miles from Libby.

Bluebird—The company has been incorporated by J. A. Ford, Henry Brink and James Ford for the purpose of working claims on the big dike, 26 miles south of Libby. It is the general belief in the district that this dike is the source of the placer gold in Libby creek.

Fisher Creek—Twenty stamps will be added to the plant at Bramlett creek, near Libby, Arthur Gordon, manager.

Nevada

Esmeralda County

Goldfield Annex—Shipments of rich gold-copper-silver ore started during the week, and developments on the 800-ft. level indicate an extensive orebody.

Florence—The mill is handling 150 tons of $20 to $25 ore with an average recovery of 95 per cent. In the mine good ore has been exposed on the Engineers' and Little Florence veins, but is not being heavily drawn on because of the good showing in other parts of the mine.

Booth—The installation of a blower and pipe system has greatly improved conditions of ventilation underground.

Pittsburg-Silver Peak—The full equipment of 120 stamps is now dropping regularly. The addition of the last 20 stamps places the mill first in point of number of stamps and second in capacity in the State.

Lincoln County

The Salt Lake railroad will be rebuilt on the same roadbed temporarily. It is said that it will take about four months to open the road for traffic. The branch from Calinete to Pioche will be in operation by May 1.

Horseshoe—A small force of men has been working in the mine clearing out,

and doing development on the 100-ft. and 300-ft. levels. The mill will start again soon, and make a run on the Little Buck ore.

LYON COUNTY

Work on the Copper Belt railroad south of Mason City, Yerrington district, is being prosecuted diligently. The smeltery plans are well under way and work will begin as soon as practicable. It is practically certain that Jules Lebarthe will superintend the construction and afterward the operation of the plant.

NYE COUNTY

Tonopah shipments for the week ended March 26, are as follows: Tonopah, 3250 tons; Tonopah-Belmont, 850; Montana-Tonopah, 890; McNamara, 170; West End, 170; Tonopah Extension, 840; Midway, 100; total, 6270 tons.

Tonopah—The mill report for the week shows 3300 tons of $19 ore crushed with the production of $58,250 worth of concentrates and bullion.

McNamara—A strike of 3 ft. of high-grade ore on the 275-ft. level is reported.

Tonopah-Belmont — As development work progresses there appears to be no break in the big vein recently exposed. Although it has been followed for 320 ft. on the 1100-ft. level, it maintains its strength for at least 65 ft. below and also appears on the 1000-ft. level.

Tonopah Extension—The mill reports show an average extraction above 90 per cent.

Eclipse—The new 10-stamp custom mill at Bullfrog is operating on Tramp Consolidated ore. The capacity is between 40 and 50 tons and custom ores carrying gold above $12 will be accepted for treatment on a guarantee of 90 per cent. extraction.

Montgomery Mountain—A reorganization of the company contemplating an assessment of 3c. per share in exchange of old stock for new, is planned to meet financial obligations. The Peery estate and Samuel Newhouse are the principal stockholders.

Montgomery-Shoshone—The January and February reports show a net loss of approximately $20,000.

New Mexico

SOCORRO COUNTY

Rosedale—This company has now in operation its 20-stamp mill and cyanide plant at Rosedale. Over 6000 ft. of work has been done. L. R. Babcock is manager.

SIERRA COUNTY

Statehood—This property at Hillsboro has a shaft down 500 ft. and several thousand feet of development. A 30-ton mill, operated by a Diesel engine, is being erected. W. H. Weston is manager.

New York

William Hall Allen and associates, of New York, have leased the old Pennock lead mine, with mineral rights over 600 acres adjoining at Macomb, St. Lawrence county. This mine, at one time worked extensively, was abandoned 45 years ago. There are three shafts on the property and about 450 ft. of drifts. The lessees will put up a power plant and air compressors. The Sam Jones mine, adjoining was reopened two years ago, and a concentrating plant built, which is now at work.

Pennsylvania

ANTHRACITE COAL

Yost Mining Company—This company has begun shipping from its new colliery at Yatesville. It controls 12 acres, on which it has completed a slope to the Marcy vein and built a breaker of 400 tons daily capacity. H. M. Houck, of Pittston, is president and H. E. Rissinger superintendent.

South Dakota

Hidden Fortune-Columbus Consolidation—Henry Frawley, of Deadwood, president of the company that is to take over these two mines, is arranging for a long-term lease which will give the company a royalty. The mines adjoin the Homestake on the north and northwest.

Minnesota Mines—While driving a tunnel at the 200, a rich strike was made.

Tinton Reduction Company—A. G. Lockhart, mine superintendent at Tinton, states that the 200-ton mill will resume soon. During the winter, 15 men have been developing the Rough and Ready vein which is proved over 200 ft. wide, with a little less than 1 per cent. tin across the face.

Utah

JUAB COUNTY

Iron Blossom—This Tintic mine is sinking the south shaft. On March 27, the shaft was 50 ft. below the 1400-ft. level. A station will be cut when the 1500 is reached. About 70 tons of ore is being mined daily from the 500 level, and a slightly greater tonnage is coming from the No. 3 shaft.

Lower Mammoth—A shipment of two cars of lead-silver ore and one car of copper ore is being prepared for the market. The orebody in the stope from the 1800-ft. level is increasing. Work is being done on the 2000-ft. level.

East Tintic Development—Connections have been made by the winze between the 230- and 330-ft. levels. An increase in silver is reported from the lower levels. It is expected that the sinking of the shaft from the 500- to the 600-ft. level will be resumed soon.

Chief Consolidated—The total shipments up to March are reported to have aggregated 2006 tons of ore, on which the net smelter returns were $46,147, or about $23 per ton. Production was begun last October. Shipments are now being made at the rate of 30 tons per day. Most of the ore comes from the 1400-ft. level, but some is also being mined from the 1600 level. Beside the work in ore, drifting is being done on the 1400, 1600 and 1700 levels.

Union Chief—This property, Santaquin district, has been developed by means of two tunnels, the lower one being 1400 ft. long; connections, which required raising a distance of about 360 ft. have been made.

SALT LAKE COUNTY

North Utah—A new strike of lead-silver ore is reported in a raise from the lowest level of the Butler-Liberal section of the property.

Thor—Drifting has been done on the vein which was cut recently on the tunnel level. From 6 in. to 1 ft. of galena ore associated with lead carbonate is reported along the foot wall. The ore, which is being mined in development, will be shipped when the roads in Big Cottonwood are open.

Bingham-New Haven—The new mill is said to be making about 80 to 90 tons of concentrates per day. About 200 tons of ore are being mined daily, and shipments of 150 tons, including concentrates, are reported. Development work is being actively carried on.

SUMMIT COUNTY

The Park City ore shipments for the past two weeks were as follows: Daly West, 2,100,000; Silver King Coalition, 1,454,320; Daly-Judge, 767,000; Daly-Judge (zinc), 665,600; Little Bell, 52,000; total, 5,038,920 pounds.

Opohongo—This company has been operating through the Black Jack workings, and is stoping ore between 300 and 400 ft. Development work is being done on the lower levels and new ore has been found on the 1400. About two carloads of ore are shipped weekly.

TOOELE COUNTY

Consolidated Mercur—The February product of the mill was shipped to Eastern buyers without refining. The output was valued at $45,000.

Bullion Coalition—A strike of lead ore is reported to have been made by leasers above the tunnel level. No mining is being done at present on company acount, but several sets of leasers are at work.

Washington

FERRY COUNTY

Blue Grass—This company is making preparations to do development. J. J. Noel is president.

Kettle River—Fine progress is being made on the construction of the 50-ton concentrator for this mine, and operations will start soon.

Blacktail—This property has been sold to J. O. Callett, of Spokane. The mine is developed. It is expected that shipments will begin soon.

Tom Thumb—Republic people have taken a lease on this mine and shipping will be resumed.

Swamp King—Some high-grade gold ore has been struck in the shaft. The company will install machinery.

SNOHOMISH COUNTY

Eclipse—This company has purchased the Copper Independent at Silverton, and will install power drills and a hoist.

West Virginia

The Consolidation Coal Company has now completed its large washing plant at Monongah in the Fairmont district. It is understood that this is preliminary to the erection of a large block of coke ovens, the first in the district.

Wyoming

At Cheyenne, March 31, the Government filed suit in the United States Court to recover title to 2000 acres of coal lands in the Elk Mountain district, Carbon county, alleged to have been fraudulently entered upon.

Canada

BRITISH COLUMBIA

Consolidated—In February the Trail plant smelted 39,835 tons of ore, of which 34,796 tons was from the company's mines. The product was 10,565 oz. gold; 169,215 oz. silver; 459,310 lb. copper; and 3,080,394 lb. lead; total gross value, $454,596.

Hedley—Heavy machinery has arrived at this mine and preparations are under way for a big season's work.

Granby Consolidated—This company has acquired about 1000 acres of low-grade copper-gold ore in the Phœnix district, formerly known as the Summit group, and development work will be started immediately.

ONTARIO

The shipments from Cobalt for the week ended March 25 are as follows: La Rose, 334,680 lb.; Nipissing, 190,626; Crown Reserve, 186,651; Kerr Lake, 120,000; O'Brien, 62,500; Coniagas, 55,300; McKinley-Darragh, 48,800; King Edward, 41,377; Waldman, 63,992; Buffalo, 52,675; Right-of-way, 63,432; Chambers-Ferland, 58,000; Millerette (Gowganda), 48,000; total, 1,326,033 pounds.

Hargraves—This property has shipped a car of high-grade ore, being the first sent out since reorganization.

Valentine Mines—This company has been organized to take over and develop the Large lot, on Cross lake.

Chambers-Ferland—The royalty question has been finally settled and this property will now become a regular shipper.

City of Cobalt—A tramway has been completed to the Northern Customs concentrator, and a contract closed for the milling of a large tonnage of low-grade ore. A. Southworth has resigned as manager and is succeeded by A. S. Stevens.

Scottish Ontario—The construction of camp buildings at Porcupine has been completed and a steam hoist and boilers have been shipped. The rock taken out is being shipped to Scotland for tests. A camp buildings at Porcupine has been tons are ready for treating.

Mexico

CHIHUAHUA

The production of the Parral camp for the week ended March 26 amounted to about 9400 tons, a considerable increase over several preceding seven-day periods. About 7000 tons was locally milled.

One of the two new furnaces at the American Smelting and Refining Company's Morse plant was blown in last week, and it is expected that the second will be in readiness within 60 days. This plant will then have a daily smelting capacity of about 800 tons.

Dolores—A recent bullion shipment consisted of 63 gold-silver bars of value of about $62,000.

Chinipas—The operative properties in this section are the White Chief and Durazno-Tetamoa, at both of which amalgamation-cyanidation plants are in service.

Palmarejo & Mexican—Operations at the mine for 15 months have been confined to developing the Prieta vein and a large tonnage is ready for stoping. The company has decided to equip the mine with a machine-drilling plant. The general manager, George E. Stephenson, is now in the United States arranging for the purchase of the plant. It is expected that by the end of 1910 the construction of a new milling plant of 300 tons per day will be commenced, and by the time that the plant is finished it is estimated over 300,000 tons of ore will be blocked out.

GUERRERO

La Dicha—J. S. Schwab has been appointed receiver for the Mitchell Mining Company of Arizona, which owned this property and the projected railroad from Acapulco.

OAXACA

On March 23 floods destroyed the steel bridge, near Ocotlan, on the Taviche road, which will increase the delay in opening the line by at least 60 days.

San Juan—This Taviche property has been restored to C. A. Hamilton and associates by an important decision of the Mexican supreme court.

SAN LUIS POTOSI

The American Smelters Securities Company, which recently purchased the mines and plant of the National Metallurgical Company, Matehuala, will install another copper furnace, of 250 tons daily capacity, raising the total capacity to 750 tons. All ore from the Dolores y Anexas of the Guggenheim interests in the Matehula district will go to this plant. Heretofore the higher grade has gone to Aguascalientes. The Cobriza and other purchased mines will be extensively developed.

SONORA

S. L. Pearce, of Alamos, has sold 625 pertenencias to parties said to represent the Lewisohn interests. The property is near Piedras Verdes, where 800 hectares are being prospected with drills by Seely W. Mudd.

San Javier—This company, operating a 10-stamp mill near Sobia, is making arrangements to also treat custom ores.

Humilidad—A shaft is being lowered on this claim, the boundary of which is but a few hundred feet from the Catalina shaft of the Calumet & Sonora.

Greene-Cananea—The widely published report to the effect that a pipe line, to bring fuel oil from California to Cananea is to be laid, has not been confirmed.

ZACATECAS

San Barnabé—An option on this old property at Zacatecas has been taken by a British company, John Cooper, representative.

Africa

CONGO FREE STATE

Union Minière du Haut Katanga—This Belgian company has ordered a concentrating and milling plant of 900,000 tons yearly capacity for the Tanganyika copper deposits.

RHODESIA

Gold production in February is reported at 48,443 oz. fine, making a total of 102,356 oz. for the two months ended Feb. 28. By values the output for the two month was $1,932,860 in 1909, and $2,115,699 in 1910; an increase of $182,839 this year. Other production in February included 20,360 oz. silver; 6 tons copper; 75 tons lead; 392 tons chrome ore; and 13,728 tons coal.

South America

BRITISH GUIANA

Gold exports from the colony, two months ended Feb. 28, were 8081 oz. bullion in 1909, and 7570 in 1910; a decrease of 511 oz. The bullion reported this year was equal to $132,326, or 6402 oz. fine gold. The exports of diamonds for the two months were 818 carats, valued at $3563; an increase of $1717 over last year.

THE MARKETS

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, April 6—The coal trade in the East shows no special change. It is not likely that it will be affected by labor troubles. Most of the large companies which ship to the East operate with nonunion labor and do not come under the socalled Interstate agreement. Most of them, however, have given advances to the miners. The Berwind-White Company announces an advance of 5c. per ton on pick mining and 5½ per cent. on day labor in all its mines both in the Clearfield district and in the Windber district in western Pennsylvania. The Consolidation Coal Company has announced a similar advance which applies to the mines in the Cumberland district in Maryland, the Fairmont in West Virginia, and the Somerset in Pennsylvania. The Westmoreland and other coal companies in the Irwin district have given a similar advance, which applies to most of the gas coal coming to tide. All of these are nonunion districts. The miners of the Clearfield and other districts in central Pennsylvania have voted to remain at work pending further negotiations over the wage settlement.

In the West the joint conference at Cincinnati failed to make any settlement and the Interstate agreement seems to have been practically abandoned, the different districts being left to make their own agreements. On April 1 there was a general suspension of mining, the miners coming out throughout western Pennsylvania, Ohio, Indiana and Illinois, while the same movement extended to the Southwestern district, including Missouri, Kansas, Arkansas and Oklahoma. The number on strike is variously estimated, but is probably not far from 300,000 men. Meantime, meetings have been called in the different districts to settle, if possible, the wage scales, and it seems probable that this will be done within a short time. In Indiana, for instance, the operators have announced their willingness to concede the 5c. advance, which the miners asked as a compromise, and the same thing will probably be done in Ohio very shortly. In western Pennsylvania there may be more delay owing to the explosive question, which has been a bone of contention for some time; and in Illinois there are the run-of-mine basis and the shot-firer questions to be settled, which will require some discussion.

Meantime, there are large stocks of coal on hand at many consuming points and at a number of the mines, and there is no probability of a shortage of coal developing unless settlements should take longer than now appears probable. In case the negotiations are protracted, moreover, there is a surplus of coal from West Virginia and Kentucky which can be drawn upon in case of need.

Coal Traffic Notes

Coal shipments from the Cumberland region in 1909 are reported as follows: Cumberland & Pennsylvania railroad, 2,747,378; Georges Creek & Cumberland, 205,201; Western Maryland, 3,047,551; total 6,000,130 tons. This compares with 5,784,591 in 1908, showing an increase of 215,539 tons, or 3.7 per cent. Statistics for this district were recorded earlier than for any other in the United States. For 68 years, 1842-1909, inclusive, the total shipments were 171,823,113 tons.

Coal and coke tonnage of Chesapeake & Ohio railway, seven months of fiscal year from July 1 to Jan. 31, short tons:

	Coal.	Coke.	Total.
New River	4,633,628	209,852	4,843,480
Kanawha	3,627,534	31,520	3,659,054
Kentucky	285,147	228	285,375
Connecting lines	55,223	30,651	85,874
Total	8,601,532	272,251	8,873,783
Total, 1908-9	7,279,420	197,707	7,477,127

Deliveries this year to points west of mines, 4,471,388 tons coal and 127,806 coke; points east, 1,137,175 tons coal and 144,444 coke; tidewater, 2,988,819 tons coal. Total increase in tonnage this year, 1,396,656 tons, or 18.7 per cent.

Coal tonnage of Norfolk & Western railroad, eight months of fiscal year from July 1 to Feb. 28, short tons:

District:	Commercial.	Company.	Total.
Pocahontas	6,258,334	814,893	7,073,227
Tug River	986,472	103,846	1,090,318
Thacker	966,665	461,601	1,428,266
Kenova	436,861	124,112	560,973
Clinch Valley	415,207	38,411	453,618
Total	9,063,539	1,542,863	10,606,402

As compared with the previous year, the total shows an increase of 2,347,399 tons, or 28.4 per cent.

Receipts of domestic coal at San Francisco in January, 37,819 long tons in 1909, and 35,548 in 1910; decrease, 2271 tons.

Coal shipments from Seattle and Tacoma, Wash., in January, 26,833 tons in 1909, and 25,870 in 1910; decrease, 963 tons. Shipments mainly to California and Alaska.

Coal passing Davis Island dam on the Ohio in January, 616,870 tons in 1909, and 451,350 in 1910; decrease, 165,520 tons.

Coal passing locks on the Monongahela above Pittsburg in January, 192,946 tons in 1909, and 192,073 in 1910; decrease, 873 tons.

Coal receipts at St. Louis in January, 621,647 short tons in 1909, and 930,979 in 1910; increase, 309,332 tons.

New York

Anthracite

April 6—The weather continues warm and domestic trade is quiet. There is still quite a run of orders from dealers for April delivery.

Schedule prices for prepared sizes are $4.25 for lump and $4.50 for egg, stove and chestnut, all f.o.b. New York harbor. For steam sizes prices are unchanged and are for pea, $3 to $3.25; buckwheat, $2.35@2.50; No. 2 buckwheat or rice, $1.75@2; barley, $1.35@1.50; all f.o.b. New York harbor according to grade.

Bituminous

Contract making is looking up a little and more business has been closed, but buyers are still adhering to their preference for the lower-priced coals. There has been an unusual amount of shopping around this year looking for low prices.

Spot business still continues rather disappointing. The Sound is taking things rather quietly, but the far East is coming into the market a little better. Prices continue about as last quoted, $2.75 New York harbor for the best grades of steam coal and from that down to $2.50@2.40 for lower grades. Transportation is good and car supply is still improving. All-rail trade shows no change.

There is a good deal of discussion about the Western strike. The general impression here is that a stoppage is not altogether unwelcome to most of the operators. It is also believed that the suspension will not last long. The miners in the Central Pennsylvania district, from which a great deal of coal comes to the seaboard, have voted to continue at work pending the settlement of the wage question, so that it is not likely the seaboard trade will be affected to any degree.

In the coastwise trade vessels are plenty and rates are gradually settling down to the summer level which promises to be rather low.

Birmingham

April 4—Every ton of coal being mined in Alabama is finding a ready demand. Efforts are still being made to secure more labor in the mining sections and the railroads are being urged to give steady service. While the home consump-

tion of coal is heavy there is a large quantity going outside of the State. Good prices hold for the product.

The coke production in Alabama is steady, and there is need for all of it. The coke production by the end of the year will be improved something like 10 per cent., several hundred coke ovens being under construction and still more being contemplated.

Chicago

April 4—Owing to large supplies laid in by the principal consuming interests, the coal market has little abnormal about it, despite the suspension of mining at the Western mines that are the city's chief supply for steam coal. There is a steady sale of such coal as comes into market and some receipts, as of smokeless West Virginia coal, are too large for profitable sales. It is variously estimated that there is enough coal in yards and on tracks to supply this market for the next 30 to 60 days. The domestic trade naturally is at a very low ebb because of warm weather all over the upper Mississippi valley. Speculative buying of steam coals has not yet amounted to anything important, but there is some of it and it will increase as supplies become scarcer. Prices on Illinois and Indiana coals have risen slightly and the fine coals especially seem destined to command high prices for an indefinite time.

Lump and egg from Illinois and Indiana mines are quoted at $2.25@2.75; run-of-mine brings $2.20@2.50; and screenings sell for $2.25@$2.30. Smokeless brings $3.05@3.30 for lump, and $2.75@3.05 for run-of-mine. Hocking Valley coal continues steady at $3.15. Inquiries from the country indicate that the demand there for coal will greatly surpass, in proportion, the demand in the city, few country consumers having laid in storage piles.

Cleveland

April 4—The coal market has been at last stirred up over suspension of mining. Buying for storage, which had about ceased, has started up again, though it is not easy to fill large orders now. Most people, however, believe that the suspension will not last long. Nominally prices are unchanged, but they are really irregular, and it is not easy to give actual quotations. This is especially the case with slack, for which some fancy prices have been paid.

Pittsburg

April 5—The suspension of mining at the end of last month found consumers with stocks sufficient to last for from two to six weeks. There is more coal being offered than is being inquired for, as the brokers have coal from the nonunion districts. A definite market basis has not been established yet, slack being offered at $1.20 and less, and mine-run at $1.25 and less, and it is likely that in some cases $1 could be shaded on slack.

A conference between miners and operators in this district is being held today in Pittsburg, but it does not seem probable that an adjustment will be reached at this time. While definite opinions are not generally hazarded, the balance of probability seems to lie in the mines getting started again about May 1. Both sides realized that a suspension for a moderate time was required.

Connellsville Coke—The market has been quiet the past week, but prices have been fairly well sustained, perhaps largely through the sentimental effect of the suspension of coal mining. Prompt furnace coke remains quotable at $1.90@2. A small contract for second half was made in the week at just a shade under $2.25, which was the asking price of several producers, and this may be quoted as the contract market on good grades. Foundry coke remains quotable nominally at about $2.75@2.85.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended March 26 at 453,986 tons, a decrease of 8000 tons from the previous week; shipments at 4748 cars to Pittsburg, 7872 cars to points west of Pittsburg and 961 cars to points east of Connellsville, a total of 13,581 cars.

St. Louis

April 4—The miners in Illinois and in all the surrounding States struck on April 1, as was expected. The market, however, was without any exciting feature up to the very end. Early in the month prices were very stiff and for a while it seemed that the coal operators and jobbers had the market well in hand and that the price would continue to advance. However, the railroads and larger consumers began to get alarmed, and succeeded in turning the market downward by circulating reports that a settlement would be reached, and by manipulating the market in other ways. Consequently, toward the end of the month prices were on the decline for the last 10 working days.

Nearly everyone has a fair supply of coal on hand and for immediate needs there is no demand whatever. A few mines carried over a little coal which they are holding for better prices. However, they are finding no demand as yet. This is a marked contrast to 1908, when 1000 cars were carried over by the various mines throughout the State of Illinois.

A few firms who handle anthracite coal are beginning to get busy to line up their anthracite trade. The new circular of $6.45 per ton for chestnut, stove or egg, and $6.20 for the grate size, went into effect April 1. Very little has been sold yet, as dealers have been giving their attention to soft coal exclusively for the past 60 days.

Standard:	F.o.b. Mine.	F.o.b. St. Louis.
6-in. lump	$2.00	$2.52
2-in. lump	1.75	2.27
Mine-run	1.50	2.02
2-in. nut	1.40	1.92
2-in. screenings	1.10	1.62
Pea and slack	0.90	1.42
Staunton, Mt. Olive & Springfield:		
6-in. lump	2.10	2.62
3-in. lump	2.00	2.52
Mine-run	1.60	2.12
2-in. nut	2.00	2.52
2-in. screenings	1.00	1.62
Carterville:		
6-in. lump or egg	1.80	2.47
3-in. nut	1.75	2.42
Mine-run	1.50	2.17
1½-in. screenings	1.25	1.92
Franklin County:		
6-in. lump or egg	2.20	2.87
3-in. nut	2.00	2.67
2-in. nut	1.50	2.17
1½-in. screenings	1.25	1.92

FOREIGN·COAL·TRADE

United States Coal Exports—Exports of coal and coke from the United States, with coal furnished to steamships in foreign trade, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Anthracite	297,096	406,287	I. 109,191
Bituminous	1,000,130	1,074,263	I. 74,133
Total exports	1,297,226	1,480,550	I. 183,324
Steamer coal	872,171	936,051	I. 63,880
Total coal	2,169,397	2,416,601	I. 247,204
Coke	155,917	138,802	D. 17,115

Canada took this year 982,682 tons of coal, or 66.4 per cent. of the total. The coke went chiefly to Mexico and Canada. Of the bunker coal this year 934,072 tons were loaded at coast ports and 1979 at Lake ports. Cuba took 160,551 tons of coal.

United States Coal Imports—Imports of coal and coke into the United States, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Anthracite	3,114	14	D. 3,100
Bituminous	208,103	289,324	I. 81,221
Total coal	211,217	289,338	I. 78,121
Coke	28,594	20,186	D. 8,408

Canada furnished this year 247,380 tons of coal and nearly all the coke; Australia, 18,451 tons coal; Japan, 20,943 tons coal.

German Coal Trade—Exports and imports of fuel in Germany, month of January, metric tons:

	Exports.	Imports.	Excess.
Coal	1,789,986	603,572	Exp. 1,186,414
Brown coal	6,546	551,547	Imp. 545,001
Coke	302,611	62,157	Exp. 240,454
Briquets	121,911	15,787	Exp. 106,124
Total	2,221,054	1,233,063	Exp. 987,991
Total, 1909	2,217,285	1,158,857	Exp. 1,058,428

Exports of coke this year included 2108 tons to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, Wales, report prices as follows on March 26: Best Welsh steam, $4.08; seconds, $3.96; thirds, $3.84; dry coals, $3.90; best Monmouthshire, $3.60; seconds, $3.48; best steam smalls, $2.40; seconds, $2.16: This is a general drop of 6c. a ton. All prices are per long ton f.o.b. shipping port, less 2½ per cent. discount.

IRON·TRADE·REVIEW

New York, April 6—The iron and steel trades still continue rather quiet. The waiting position has not been abandoned yet and the Western coal strike has affected the market sympathetically in some degree.

Pig-iron buying has been comparatively light. There seems to be little or no demand for bessemer or basic pig from the merchant furnaces in the Central West. There is more buying of foundry iron, but the users do not seem disposed to extend their commitments beyond the second quarter, unless they can secure substantial concessions in price. The continued offering of cheap Southern iron has disturbed the market in Eastern territory.

In finished material some business has been done in structural steel and there is also a good demand for bars and similar material which are reported selling well through jobbers. Railroad orders seem to have been suspended for the present.

Two foreign orders for rails are reported, one of 12,000 tons for Queensland and one of 10,000 tons for Manchuria; both going to Steel Corporation mills.

Importing Chinese Ore—A despatch to the Cleveland *Iron Trade Review* says: "A contract has been signed between the Western Steel Corporation of Seattle, Wash., and the Hanyang Iron and Steel Works, of Hangkow, China, by the terms of which the Steel Corporation contracts for the annual shipment of 100,000 tons of iron ore and 100,000 tons of pig iron from China, to Irondale, for a period of 15 years, with the privilege of renewal. The first shipments are expected to arrive on Puget sound May 15. It is stated the iron ore can be landed on the Pacific Coast for $3 per ton.

Baltimore

April 4—Imports for the week included 30 tons spiegeleisen, 2155 tons ferromanganese, and 88 casks silicospiegel from Liverpool; 600 tons manganese ore from Rotterdam; 17,350 tons iron ore from Cuba. Exports included 2025 tons steel rails to Argentina.

Birmingham

April 4—The activity in steel is attracting all the attention in the Southern field. The pig-iron market continues quiet. There is a little demand for iron and the quotations are a little higher than they have been. The lowest price now quoted is $13 per ton, No. 2 foundry, and very little is to be had at that price, save perhaps for immediate delivery. The furnace companies are beginning to hold to $13.50 and very little iron is going to the furnace yards. The make has been reduced a little by the blowing out of a furnace or two, but this was found necessary because of needed repairs. The demand for steel, in all shapes, is strong and there is no indication that the plants of the Tennessee company will be closed down any time this year. A recent sale of 10,000 tons of steel billets is reported. The rail mill has orders in hand that will require a steady operation for months to come.

Inquiries for pig iron are still coming in, the third quarter being the principal period. Some inquiries are coming in for the last quarter but so far the furnace companies are not willing to quote flat figures. The sale of a good round amount of iron to the cast-iron pipe people is reported in this district. Rumor has it that the iron was secured under the $13 basis. Basic and charcoal irons are still in good demand.

Chicago

April 4—Buying of pig iron continues to be light, and in small lots scattered throughout the foundry trade, with here and there a lot of fair size and with inquiries indicating heavy prospective needs but an unwillingness to buy until the melter feels that the bottom of the market has been surely reached. At $12.50 Birmingham, or $16.85 Chicago, considerable Southern No. 2 iron has changed hands, and Northern is by no means so steady as it has been, though holding up well to $18 for No. 2. The greater part of the business, as heretofore, is in Southern, and the aggregate tonnage perhaps is not so indicative of weakness as quotations imply, for buying, though in small lots, is general and steady. The ordinary melter of pig iron is buying for the third quarter or last half, with no perceptible difference in prices between deliveries in these periods and iron needed in the second quarter, for which there is enough demand to show that foundrymen are running closely up to their visible requirements in buying. Of basic and malleable irons sales have been good in the last week, for the last half generally. Iron and steel products continue in fair demand, with railroad supplies and structural material selling well. Coke is dull at $4.75 and in large supply.

Cleveland

April 4—Some inquiries for iron ore are reported, from eastern furnaces, but no sales. The ice is going out at the Sault, which looks like an early opening of navigation.

Pig Iron—Few sales are reported. There are some offers for second-quarter iron, but at prices which furnaces do not like. For Cleveland delivery $16@16.50 is quoted for No. 2 foundry, and $16 for forge.

Finished Material—A little business has been done in structural steel. Some cutting on sheets and plates is reported. A good order for girder rails and steel ties has been placed by a local trolley company.

Philadelphia

April 6—Large sales of basic and foundry pig iron have been made within a few days as the outcome of negotiations started two or three weeks ago. The transactions in basic hung fire several days over the question of price. Further transactions will probably take place, especially in basic, the requirements for which are heavy and the necessities urgent. There has been much delay in the placing of orders for foundry and recent orders represent only a small portion of the total estimated requirements. The quotations given for basic are $18.25 but the actual price paid is held back. No. 2 X foundry is quoted at the same figure and most of the sales made were controlled by the makers of the better brands on the market. More liberal offerings have been made of Southern irons and appearances indicate that less money will be taken for early summer deliveries. The ruling quotation for forge is $17.25. Southern is offered 25 or 50c. less.

Steel Billets—An improving demand for open-hearth billets is apparent but most of the orders are for small lots.

Bars—Retail sales of bar iron are naturally heavier at this time but there is very little business done in a large way.

Sheets—Manufacturers report a slight increase in business coming from a few large users.

Pipes and Tubes—No open changes in quotations have been made but prices are not as strong as they were.

Plates—The average volume of small orders has been booked this week and the outside selling prices were easily maintained.

Structural Material — Manufacturers are figuring on a dozen or more large requirements which will assuredly terminate in orders. Local requirements for small lots are urgent and top prices prevail.

Scrap—Heavy melting steel scrap has been largely cleaned up and No. 1 yard scrap is in good demand. Heavy cast scrap has been sold at 50c. a ton higher.

Pittsburg

April 5—Demand for steel products has not shown any further improvement in the past week, but it cannot be said, either, that it has decreased. There is really more business being done than is generally assumed. The trouble with the industry, or what would be regarded as trouble by producers, is that demand is just a trifle under producing capacity instead of being just a trifle over, whereby the market has no "snap"; in other

words, there is not the least basis for advancing prices. If, suddenly, demand were reduced 10 per cent. and 20 per cent. of existing capacity disappeared at the same time, conditions would doubtless be produced which would lead to the market being considered a very active one, although the total business actually transacted would be reduced.

There is an improvement in buying in some directions which is clearly attributable to the progress of the season. There is no improvement in railroad buying, but as a matter of fact the railroads have been fairly good buyers; a comparison of actual orders placed in the past few weeks shows that they have been well ahead of the average rate in 1908 and 1909, although correspondingly behind the average rate in the three preceding years. Demand for pipe has somewhat improved, but not enough to take care of the heavy stocks accumulating, and last Wednesday night the Lorain plant of the National Tube Company was closed, its warehouses being fuller than for years. There was too much pipe taken by jobbers last fall, when the market was excited and expecting advances, to permit of much additional taking from mills in the winter, when distribution into actual consumption was light.

Pig Iron—Few sales are openly reported in the market, but it is evident that there has been a great deal of quiet selling in the past few weeks, at concessions from regularly quoted prices. This has strengthened the furnace position but it is doubtful if it has strengthened the market, or will permit of any advances in the near future. We note a sale of 3000 tons of bessemer and one carload, both for shipment east, at $17.50, Valley, and continue to quote that as the market. A sale of 500 tons of malleable was made at $16, Valley, this price being quotable on malleable, No. 2 foundry and basic, although in the case of foundry it could probably be shaded by a close buyer.

Ferromanganese—The market has been weak, with prices irregular. Sales of prompt have been made at $41, Baltimore, and this price could probably be done again, while deliveries over second quarter could probably be had at $41.50. On April 1 the freight from Baltimore to Pittsburg was restored to the old rate of $1.95, from which it was advanced to $2.30 on Jan. 1 last.

Steel—Some off lots of resale bessemer billets have gone at $27, mill, or possibly at less. Open-hearth billets are, if anything, stronger, when any special analysis or size is wanted. In general the market can be quoted unchanged at $27@27.50 for bessemer billets, $27.50@28 for open-hearth billets, $28.50@29 for sheet-bars, and $33 for rods, all f.o.b. maker's mill, Pittsburg or Youngstown district.

Sheets—Prices are better maintained than they were, concessions amounting to only $1 a ton at most, and then only on good sized orders. Regular prices are 2.40c. on black and 3.50c. on galvanized, with corrugated roofing at $1.70 for painted and $3 for galvanized. Blue annealed sheets on contract, for far forward delivery, go at 1.75c., but prompt deliveries command 1.90c. or even higher. The leading interest has begun booking sheet orders through the year, and so much of its business taken for delivery before July 1 is certain to run over into third quarter that it has little unsold tonnage for that quarter.

FOREIGN IRON TRADE

United States Foreign Trade—Exports and imports of iron and steel in the United States for the two months ended Feb. 28 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1909.	1910.	Changes.
Exports.....	$21,276,547	$25,093,856	I.$ 3,817,309
Imports.....	3,655,131	6,280,306	I. 2,625,175
Excess, exp.	$17,621,416	$18,813,550	I.$ 1,192,134

The leading items were as follows, in long tons:

	Exports— 1909.	Exports— 1910.	Imports— 1909.	Imports— 1910.
Pig iron.....	5,962	7,640	20,643	39,237
Scrap.....	1,596	658	1,064	33,139
Billets, blooms, etc.	15,974	4,676	2,018	7,312
Bars.....	10,761	16,290	3,653	5,386
Rails.....	33,714	75,685	225	1,487
Sheets and plates..	19,990	45,298	398	993
Structural steel....	15,813	17,795	1,833	1,521
Wire-rods.....	2,142	1,876	1,834	2,749
Wire.....	20,115	22,634	.....	.....
Nails and spikes..	8,353	8,951	.....	.....
Tinplates	2,073	1,679	7,453	10,963
Pipe and fittings..	16,982	25,008	.....	.....

Imports of wire not given in quantities; values were $156,568 in 1909, and $208,550 this year.

United States Iron Ore Movement—Imports and exports of iron ore in the United States, two months ended Feb. 28, long tons:

	1909.	1910.	Changes.
Imports.....	166,982	455,250	I. 288,268
Exports.....	11,799	8,513	D. 3,286

Of the imports this year 245,150 tons were from Cuba, and 173,989 tons from Europe.

Imports of manganese ore for the two months were 35,060 tons in 1909, and 44,433 in 1910; increase, 9373 tons.

German Iron Production—The German Iron and Steel Union reports the make of pig iron in February at 1,091,351 tons, being 86,223 tons less than in January. For the two months ended Feb. 28 the production was, in metric tons:

	1909.	1910.	Changes.
Foundry iron	376,554	435,026	I. 58,472
Forge iron.....	114,732	110,108	D. 4,624
Steel pig.....	182,067	199,264	I. 17,197
Bessemer pig.....	72,671	76,972	I. 4,301
Thomas(basic)pig	1,225,364	1,447,555	I. 222,191
Total..... ..	1,971,388	2,268,925	I. 297,537

Total increase this year, 15.1 per cent. Steel pig includes spiegeleisen, ferromanganese, and all similar alloys.

METAL MARKETS

New York, April 6—The metal markets generally show little change, and no special activity.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 127 for the month of January; 124 for February.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1910..	$ 2,937,134	$ 3,063,116	Imp. $ 125,982
" 1909..	8,860,814	3,576,444	Exp. 5,284,370
Year 1910..	9,100,266	6,194,473	" 2,905,793
" 1909..	16,696,170	6,966,627	" 9,699,543
Silver:			
Feb. 1910..	4,588,619	3,155,329	Exp. 1,433,290
" 1909..	4,852,549	3,508,935	" 1,343,614
Year 1910..	9,086,923	7,403,683	" 1,683,240
" 1909..	9,394,643	7,173,687	" 2,220,956

Exports from the port of New York, week ended April 2: Gold, $104,816, to the West Indies; silver, $723,142, chiefly to London. Imports: Gold, $1,621,831, including $1,544,000 French coin in transit: silver, $71,943, from Central and South America.

Gold—There was a considerable demand for gold on the open market in London this week. The price of bars remained unchanged at 77s. 9d. per oz., but the Bank of England offered a premium on American coin, making the price 77s. 5½d. per oz. This resulted in the taking of $7,500,000 in New York for export to London and more is expected to follow.

Platinum—Business is steady and the market is firm. There is some expectation of an advance, but as yet prices are unchanged, dealers asking $29@29.50 per oz. for refined platinum, and $34.50 per oz. for hard metal.

Silver—The market has continued to show considerable strength on buying by India bazaars and China banks. The market closes steady at 24 1/6d. in London.

SILVER AND STERLING EXCHANGE

Mar.-Apr.	31	1	2	4	5	6
New York....	52½	52⅝	52½	52½	52⅝	52⅝
London	24 3/16	24 1/16	24 1/16	24 1/16	24 1/16	24 1/16
Sterling Ex.	4.8750	4.8770	4.8775	4.8795	4.8785	4.8775

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East from Jan. 1 to March 23, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£1,083,000	£1,375,500	I. £ 292,500
China.....	657,000	904,500	I. 247,500
Straits.....	82,800	.....	D. 82,800
Total.....	£1,822,800	£2,280,000	I. £ 457,200

India Council bills sold in London at an average of 16.13d. per rupee.

The cable reports the gold production of the Transvaal in March at 615,000 oz., or $12,712,050. This makes the total for the three months ended March 31 this year 1,791,990 oz., or $37,040,433; an increase of $76,611 over the first quarter of last year.

Copper, Tin, Lead and Zinc

Mar.-Apr.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
31	13⅜ @13⅝	13 @13¼	57¾	33¼	4.37½ @4.40	4.22½ @4.25	5.42½ @5.45
1	13⅜ @13½	13 @13⅛	58⅛	33¼	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
2	13⅜ @13½	13 @13⅛	. . .	33¼	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
4	13⅜ @13½	13 @13⅛	58⅛	33⅛	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
5	13⅜ @13½	13 @13¼	58	32⅞	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½
6	13⅜ @13½	13 @13⅛	58⅛	33	4.37½ @4.40	4.22½ @4.25	5.42½ @5.47½

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—Some of the large sellers made a strong effort during the past week to stimulate business by offering further concessions. They succeeded to a certain extent in procuring some orders from domestic consumers and a fairly large business for export, but it is said that on the latter particularly the prices have been somewhat lower than expressed in the quotations. Lake has again been entirely nominal. The close is reported at 13⅜@13½c. for Lake copper, and 13@13⅛c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 12⅞@13 cents.

Copper sheets are 19@20c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14¾c. base, carload lots at mill.

The London market has fluctuated within narrow limits throughout the week and closes steady at £58 2s. 6d. for spot, and £59 5s. for three months.

Refined and manufactured sorts we quote: English tough, £61; best selected, £61@£61 10s.; strong sheets, £70@£71.

Copper exports from New York and Philadelphia for the week were 2784 long tons. Our special correspondent gives the exports from Baltimore at 717 tons copper.

Tin—As was generally expected, the statistics for the month of March turned out to be very favorable. Notwithstanding the Banka sale which took place last month, the visible supply decreased over 900 tons. The market in consequence ruled very firm up to the beginning of this month, but weakened after the statistics became known. The high point of £152 10s. for spot and £154 10s. for three months was reached on March 31. The close is cabled as firm at £150 for spot and £152 2s. 6d. for three months.

In the domestic market a few purchases for near-by delivery were made by consumers, and there was some business in future tin among dealers, the sellers being prepared to quote somewhat below import prices. At the close, tin is quoted at about 33 cents.

Visible stocks of tin—including tin afloat—on April 1 are estimated as follows: London, 10,185; Holland, 3109; United States, excluding Pacific ports, 6909; total, 20,203 long tons, a decrease of 1085 tons from the March report.

Lead—The market is steady at the last quotations, 4.37½@4.40c. New York, and 4.22½@4.25c. St. Louis.

The London market for lead has been rather easier; the closing quotations are cabled lower at £12 13s. 9d. for Spanish, and £12 16s. 3d. for English.

Spelter—There has been sufficient business to take care readily of current offerings, and the market closes firm at 5.57½@5.62½c. New York, and 5.42½@5.47½c. St. Louis.

New York quotations for spelter, March 31 were 5.57½@5.60c.; April 1-6, inclusive, 5.57½@5.62½ cents.

The London market is unchanged at £23 for good ordinaries and £23 5s. for specials.

Base price of zinc sheets is $7.75 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Business is active in all lines. The market is strong at 23¼@23½c. per lb. for No. 1 ingots in large lots, New York. Demand appears to be fully up to production.

It is reported that the Canadian Hydro-Electric Commission has placed an order with the Aluminum Company of America for 1,500,000 lb. wire, to be used in transmitting power from Niagara Falls to Toronto.

Antimony—The market is quiet, with only moderate sales. There has been a slight readjustment in prices, Cookson's being quoted at 8⅜@8½c. per lb., while 7⅞@8c. is asked for U. S. and 7⅜@7½c. for outside brands.

Quicksilver—The market is easier and there has been a slight drop in prices. The New York quotation is $48 per flask of 75 lb.; jobbers ask 67@69c. per lb. for retail lots. San Francisco, $47@48 for domestic business; $2 less for export. The London price is £9 5s., but jobbers sell at £9 1s. 3d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots f.o.b. New York.

Cadmium—Current quotations are 65@70c. per lb. in 100-lb. lots at Cleveland, Ohio. Prices in Germany are 500@550 marks per 100 kg.—average 56.7c. per lb.—f.o.b. works in Silesia.

Imports and Exports of Metals

Exports and imports of metals in the United States, two months ended Feb. 28, are reported as follows, in the measures usual in the trade:

Metals:	Exports.	Imports.	Excess.
Copper, long tons	55,438	22,998	Exp. 32,440
Copper, 1909....	36,542	21,401	Exp. 15,141
Tin, long tons....	60	9,221	Imp. 9,161
Tin, 1909.....	70	5,944	Imp. 5,874
Lead, short tons.	15,440	18,108	Imp. 2,668
Lead, 1909.....	13,839	18,473	Imp. 4,634
Spelter, sh. tons	224	717	Imp. 493
Spelter, 1909....	724	680	Exp. 44
Nickel, lb.....	2,136,223	5,116,641	Imp. 2,980,418
Nickel, 1909....	1,490,116	2,163,266	Imp. 673,150
Antimony, lb....	.....	1,337,767	Imp. 1,337,767
Antimony, 1909.	.....	1,094,991	Imp. 1,094,991
Platinum, oz.....	... .	16,984	Imp. 16,984
Platinum, 1909.	.. ....	21,841	Imp. 21,841
Quicksilver, lb ..	15,642	.....	Exp. 15,642
Quicksilver, '09	8,878	.....	Exp. 8,878
Aluminum, value	$43,706	.....	Exp. $43,706
Aluminum, 1909	13,575	.....	Exp. 13,575
Ores, etc.:			
Zinc oxide, lb. ..	3,908,222	.....	Exp. 3,908,222
Zinc oxide, '09..	4,067,311	.....	Exp. 4,067,311
Zinc dross, lb....	407,480	.....	Exp. 407,480
Zinc dross, '09..	2,259,462	.....	Exp. 2,259,462
Zinc ores, lg. tons	4,375	11,222	Imp. 6,847
Zinc ores, 1909.	.....	13,242	Imp. 13,242
Antim'y ores, lb.	.....	.....	.....
Ant. ores, 1909.	504	2,343,918	Imp. 2,343,414
Chrome ore, tons	20	8,121	Imp. 8,101
Chrome ore, '09	.....	6,801	Imp. 6,801

Copper, lead and nickel (and antimony from Aug. 5, 1909) include the metal contents of ores, matte, bullion, etc. The exports given include reëxports of foreign material. Zinc contents of ore imported in 1910, were 8,570,935 lb.; not reported prior to date of new tariff. Quantity of antimony ore is not reported this year, only metal contents being given.

Zinc and Lead Ore Markets

Platteville, Wis., April 2—The base price of 60 per cent. zinc ore was $42@43 per ton. The base price of 80 per cent. lead ore was $50 per ton.

SHIPMENTS, WEEK ENDED APRIL 2.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point...	584,000	56,000	.....
Highland.....	418,900	.....	.....
Platteville.....	320,800	.....	470,660
Benton.....	251,050	....	.....
Cuba City.....	174,385	.....	.....
Galena.....	88,000	.....	.....
Linden.....	.....	.....	170,380
Total.....	1,837,135	.....	641,040
Year to date.....	20,290,905	1,461,199	4,056,090

In addition to the above there was shipped during the week to the separating plants, 2,289,770 lb. zinc concentrates.

Joplin, Mo., April 2—The highest price paid for zinc sulphide ore was $46, the base ranging from $43 down to $40 per ton of 60 per cent. zinc. Zinc silicate sold at $16@24 per ton. The average price, all grades zinc ore was $39.44 per ton. Lead ore sold all week at $50 per ton for the best grades, with deductions for each 1 per cent. under 80 per cent., but with no advances for ores assaying over 80 per cent. lead. The average price, all grades of lead ore, was $49.92 per ton.

Outputting conditions were generally fair, though there is an increasing shortage of mine workers, as the men are drawn west by higher prices in those mines. The coal strike will not affect outputting to any serious extent immediately, but if long continued will cripple the output in camps isolated from the natural gas supply. It will, however, put a stop to nearly all drill prospect work all over the district.

SHIPMENTS. WEEK ENDED APRIL 2.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,789,400	957,700	$122,125
Joplin	1,692,080	301,150	43,485
Duenweg	1,006,360	204,600	24,236
Alba-Neck	600,930	10,840	14,092
Galena	512,940	59,250	11,995
Granby	492,040	15,100	6,970
Aurora	306,140	49,850	6,252
Spurgeon	278,590	50,070	5,864
Quapaw	267,800	7,050	5,528
Carthage	184,810	.....	4,065
Miami	336,330	11,650	3,984
Carl Junction	141,080	.....	2,962
Badger	140,600	.....	2,952
Cave Springs	109,300	.....	2,240
Sarcoxie	167,160	.....	2,301
Totals	11,025,560	1,167,260	$259,051
14 weeks	151,571,820	22,981,190	$3,760,142
Zinc value, the week, $217,430; 14 weeks,			$3,136,962
Lead value, the week, 41,621; 14 weeks,			623,180

MONTHLY AVERAGE PRICES.

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$41.25	$47.31	$38.46	$45.16	$52.17	$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	.....	37.01	.....	55.63	.....
May	40.06	.....	37.42	.....	56.59	.....
June	44.15	.....	40.35	.....	57.52	.....
July	43.06	.....	41.11	.....	53.74	.....
August	48.25	.....	44.54	.....	57.60	.....
September	47.70	.....	44.87	.....	56.11	.....
October	49.50	.....	45.75	.....	55.02	.....
November	51.31	.....	48.29	.....	53.94	.....
December	49.45	.....	47.57	.....	55.26	.....
Year	$43.98	.....	$41.20	.....	$54.60	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

CHEMICALS

New York, April 6—There has been little change in the general market, which continues fairly steady, showing a good amount of business done.

Copper Sulphate—Business is steady and the market shows no change. Prices continue $4.10 per 100 lb. for carload lots and $4.35 for smaller orders.

Nitrate of Soda—Sales of spot nitrate continue large and the article holds firm at 2.15c. per lb. The prospect of large imports has weakened futures and they are rather soft at 2.05c. per lb. for the balance of the year.

Arsenic—Early in the week there was considerable activity but it subsided later. There is rather a wide range, quotations varying from $2.37½ up to $2.62½ per 100 lb. for white arsenic.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, two months ended Feb. 28:

	Imports.	Exports.	Excess.
Copper sulph. lb.	.....	1,748,703 E.	1,748,703
Copper sul., '09	.....	1,318,978 E.	1,318,978
Bleach, lb.	15,459,932	..... I.	15,459,932
Bleach, 1909	12,814,773	..... I.	12,814,773
Potash salts, lb.	107,579,742	804,221 I.	106,775,521
Potash salts, '09	57,491,844	1,108,105 I.	56,383,739
Soda salts, lb.	3,047,587	113,907 I.	2,933,680
Soda salts, 1909	2,005,224	94,002 I.	1,911,222
Acetate lime, lb.	.....	10,203,111 E.	10,203,111
Acetate, 1909	.....	16,725,160 E.	16,725,160
Nit. of soda, tons	96,769	1,790 I.	94,979
Nitrate, 1909	46,526	1,035 I.	43,491
Phosphates, tons	3,894	101,280 E.	97,386
Phosphates, '09	425	119,005 E.	118,580
Sulphur, tons	5,803	11,925 E.	6,122
Sulphur, 1909	5,737	6,537 E.	800
Pyrites, tons	132,756	..... I.	132,756
Pyrites, 1909	94,126	..... I.	94,126
Magnesite, lb.	37,352,402	1,348,602 I.	36,003,800
Magnesite, 1909	.....	.....	.....

Exports include reëxports of foreign material. Figures for magnesite not reported separately prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 58,905 tons.

MINING STOCKS $

New York, April 6—The general stock market has been quiet and inclined to weakness. Prices, however, have been irregular, some stocks having taken a turn upward though not to any great extent, while others have reported lower quotations. The volume of trading was small throughout the week.

The Curb market was also dull and irregular. A few of the copper stocks came near holding their own, but the majority recorded lower prices. Trading was not at all active and such changes as were made were on small business.

At public auction in New York, March 30, sales were made of 200 shares Goldfield-Daisy Mining Syndicate, $1 par, at 8c. per share; 2500 shares Butte-New York Copper Company, $5 par, at 70c. per share. Ten shares Greene Consolidated Gold Company, lumped in with 20 shares Distilling Company of America and 100 shares Electric Vehicle Company, brought $121 for the lot.

Boston, April 5—Copper shares show little or no rallying power. One thing after another has happened to discourage holders of these stocks and although there is a ray of sunlight it is but faint as yet.

Arizona Commercial sought a low at $18 and has recovered but little from the sharp decline of above $52 only a few months ago. President Amster talks hopefully. The decline started when the company reported a floating debt of $385,000 as of Dec. 31 last, which has grown in the meantime.

Granby mining has steadied as liquidation has ceased. Utah Consolidated worked off to $24.50 today as a result of the issue of the annual report.

Lake Copper fell $11.50 to $52 over night and is off $16 net for the week as the result of the mill run for March. Indiana was carried off $6 to $26 and North Lake $2 to $14.25, although for the week the former has fallen $12 and the latter $2.75 net.

Calumet & Hecla has worked off $30

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	January.	February.	March.
Arizona, Ltd.	2,646,000	2,658,000	.....
Boleo (Mexico)	2,644,800	2,331,832	.....
Copper Queen	10,001,000	8,927,203	.....
Calumet & Ariz.	2,331,000	2,024,000	.....
Cananea (Mexico)	3,500,000	3,586,000	.....
Detroit	2,166,156	1,486,400	.....
Imperial	850,000	750,000	.....
Nevada Con. (Est.)	3,800 000	5,000,000	.....
Old Dominion	2,130,000	2,035,000	2,674,000
Shannon	1,510,696	1,526,000	1,468,000
Superior & Pitts.	2,166 000	1,864,000	.....
Utah Copper Co.	4,745,066	5,798,819	.....
Butte District	19,250,000	13,758 620	24,700,000
Lake Superior	19,260,127	18,250,000	.....
Total production.	77 000,845	69,995,874	.....
Imports, bars, etc.	24,305,526	14,093,381	.....
Imp. in ore & matte	7,053,522	6,063,764	.....
Total	108,359,893	90,153,019	.....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
IV, 1909	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	117,828,655	69,519,501	59,546,570
Year	1,405,403,056	705,051,591	680,942,620
I, 1910	116,547,287	78,158,387	81,691,672
II	112,712,493	66,618,322	37,369,518
III	.....	.....	.....

	Visible Stocks. United States.	Europe.	Total.
IV, 1909	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I, 1910	141,766,111	244,204,800	385,970,911
II	98,463,339	248,236,800	346,700,139
III	107,187,992	254,150,400	361,338,392
IV	.....	249,625,600	.....

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

to $670 since the death of President Agassiz was announced. North Butte has steadied since broker Charles A. Clark of this city has sought to get proxies for a minority representation on the board of directors.

The weakness of Arizona Commercial brought sympathetic declines in Boston & Corbin and Shannon and the break in Lake caused recessions in South Lake, Bohemia and Oneco on the Curb. First National has broken to $2.62½ on the Curb. An assessment now seems imminent.

American Zinc, Lead and Smelting directors have declared a dividend of 50 cents, payable April 20, and have also authorized the sale of $750,000 in 6 per cent. five-year convertible debenture bonds which will bring the working capital up to $1,000,000. The bonds are underwritten.

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha Con , Nev.	Mar. 12	Apr. 7	$0.05
Belcher, Nev.	Mar. 9	Mar. 29	0.10
Brown Stone, Utah	Apr. 15	June 10	0.00½
Cardiff, Utah	Mar. 10	Mar. 28	0.00½
Central Eureka, Nev.	Mar. 13	Apr. 23	0.02½
Chollar, Nev	Mar. 8	Mar. 31	0.10
Columbus Con., Utah		May 11	0.25
Confidence, Nev.	Mar. 25	Apr. 15	0.20
Con. Imperial, Nev.	Apr. 19	May 12	0 01
Gould & Curry, Nev.	Mar. 14	Apr. 6	0.10
Hale & Norcross, Nev.	Mar. 9	Mar. 31	0.10
Hancock, Mich.	May 2		3.00
New Arcadian, Mich.	Mar. 10		1.00
Ojibway, Mich.	Mr.Oct.		2.00
Ophin, Nev.	Apr. 22	May 16	0.25
Oneco, Mich.	Feb. 15		1.00
Overman, Nev	Apr. 6	Apr. 27	0.10
Potosi, Nev.	Apr. 5	Apr. 28	0.10
Seven Troughs Mon., Utah.	Mar. 12	Apr. 2	0.00½
Sierra Nevada, Nev.	Apr. 7	Apr. 27	0 10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Utah, Nev.	Apr. 12	May 3	0 05
Yellow Jacket, Nev	Mar. 7	Apr. 11	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428		23.708	
May	52.905		24.343	
June	52.138		24.166	
July	51.043		23.519	
August	51.125		23.588	
September	51.440		23.743	
October	50.923		23.502	
November	50.703		23.351	
December	52.226		24.030	
Total	51.502		23.726	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	New York.				London.	
	Electrolytic		Lake.			
	1909.	1910.	1909.	1910.	1909.	1910.
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.332	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.56⅛		12.93⅞		57.363	
May	12.893		13.238		59.338	
June	13.214		13.548		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		13.354		58.917	
December	13.298		13.647		59.906	
Year.	12.982		13.335		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	27.380	32.700	July	29.207	
February	28.978	32.920	August	29.942	
March	30.577	32.403	September	28.815	
April	31.702		October	29.444	
May	30.015		November	30.348	
June	28.024		December	29.154	
			Av. Year.	29.465	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.845	4.307	13.438	13.063
April	4.168		4.051		13.297	
May	4.287		4.214		13.225	
June	4.350		4.291		13.031	
July	4.321		4.188		12.563	
August	4.363		4.227		12.475	
September	4.342		4.215		12.781	
October	4.341		4.215		13.175	
November	4.370		4.252		13.047	
December	4.560		4.459		13.125	
Year.	4.273		4.153		13.049	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.01	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.563	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965		4.815		21.531	
May	5.124		4.974		21.975	
June	5.402		5.252		22.000	
July	5.402		5.252		21.969	
August	5.729		5.579		22.125	
September	5.796		5.646		22.906	
October	6.199		6.043		23.200	
November	6.381		6.231		23.188	
December	6.249		6.099		23.094	
Year.	5.503		5.352		22.201	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	$17.18	$19.90	$16.40	$17.98	$16.26	$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79		15.05		15.06	
May	15.77		15.02		15.08	
June	16.13		15.84		15.63	
July	16.40		15.90		15.96	
August	17.16		16.17		16.20	
September	18.44		16.80		17.03	
October	19.75		17.84		18.02	
November	19.90		18.37		18.09	
December	19.90		18.15		17.90	
Year.	$17.46		$16.46		$16.40	

STOCK QUOTATIONS

COLO. SPRINGS Apr. 5

Name of Comp.	Bid.
Listed:	
Acacia	.05½
Cripple Cr'k Con.	.02⅝
C. K. & N.	.12½
Doctor Jack Pot.	.07⅞
Elkton Con.	.69
El Paso	.68½
Fannie Rawlins.	.05
Findlay	.09⅜
Gold Dollar	.09½
Gold Sovereign	.04
Isabella	.17
Mary McKinney.	.46
Pharmacist.	.03
Portland	1.10
Vindicator	.80
Work	.04½
Unlisted:	
Golden Cycle	1.50
United Gold Mines	.09½

SALT LAKE Apr. 5

Name of Comp.	Clg.
Carisa	.59
Colorado Mining	.78
Columbus Con	.30
Daly Judge	‡4.10
Grand Central	1.50
Iron Blossom	1.05
Little Bell	1.65
Little Chief	‡.45
Lower Mammoth	‡.50
Mason Valley	1.65
Maj. Mines	‡2.32½
May Day	‡.19½
Nevada Hills	.50
New York	.13
Prince Con	.87
Red Warrior	‡6.00
Silver King Coal'n	2.45
Sioux Con	.45
Uncle Sam	.39½
Victoria	1.25

SAN FRANCISCO. April 5.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Atlanta	.14
Belcher	.90
Best & Belcher	.25
Caledonia	.64
Challenge Con	.30
Chollar	.22
Confidence	1.05
Con. Cal. & Va	1.12
Crown Point	.90
Exchequer	.25
Gould & Curry	.26
Hale & Norcross	.42
Mexican	1.27
Ophir	1.15
Overman	1.25
Potosi	.30
Savage	.32
Sierra Nevada	.54
Union	.70
Yellow Jacket	.90

Name of Comp.	Clg.
MISC. NEVADA	
Belmont	2.50
Daisy	.08
Jim Butler	.18
MacNamara	.33
Midway	.31
North Star	.01
West End Con	.36
Atlanta	.14
Booth	.10
C.O.D. Con	.05
Columbia Mt.	.06
Comb. Frac.	.44
Great Bend	.03
Jumbo Extension	.36
Oro	.07
Red Hill	.04
Sandstorm	.03
Silver Pick	.10
St. Ives	.16
Tramps Con	.05

N. Y. EXCH. Apr. 5

Name of Comp.	Clg.
Amalgamated	76⅜
Am. Agri. Chem.	45
Am.Sm.&Ref.,com	82⅛
Am. Sm. & Ref., pf.	106
Anaconda	47⅜
Bethlehem Steel	30
Col. & Hock. C. & I.	13⅜
Colo. Fuel & Iron.	40
Du Pont P'd'r, pf.	87½
Federal M. & S.	53¼
Great Nor., ore ctf.	67½
Nat'nalLead,com.	81
National Lead, pf.	108½
Pittsburg Coal.	20½
RepublicI&S,com.	37
Republic I & S, pf.	100
SlossSheffi'd,com.	‡75
Sloss Sheffield, pf.	‡117½
Tennessee Copper	‡31⅛
Utah Copper	46¼
U. S. Steel, com.	85¼
U. S. Steel, pf.	120
Va. Car. Chem.	59

N. Y. CURB Apr. 5

Name of Comp.	Clg.
Bonanza Creek	3
Boston Copper	18
Braden Copper	4⅞
B. C. Copper	6½
Buffalo Mines	3½
Butte Coalition	23¼
Chino Copper	14⅛
Cobalt Central	.15½
Combination Fra.	.48
Con. Ariz. Sm.	2⅛
Cumberland Ely.	9
Davis-Daly	2⅞
Dominion Cop.	7
Ely Con	.68⅞
El Rayo	3
Florence	3⅛
Gila Copper	7⅛
Giroux	8⅛
Gold Hill	1½
Goldfield Con	7⅞
Greene Cananea	9½
Guanajuato	1⅜
Guggen. Exp.	200
Kerr Lake	.08¾
La Rose	4 5/16
McKinley-Dar-Sa.	.96
Miami Copper	23¾
Mines Co. of Am.	48
Montezu. of C. R.	2½
Mont. Shoshone	⅞
Mont.-Tonopah	.70
Nev. Utah M. & S.	1⅛
Newhouse M. & S.	3½
Nipissing Mines	10⅛
Ohio Copper	4
Pacific Sm. & M.	¾
Silver Queen	.18
Standard Oil	620
Stewart	3 1/16
Tonopah	6¾
Tonopah Ex.	.78
Tri-Bullion	1 5/8
Utah Apex	‡3¾
W. Va. Wyo. Cop.	2 1/16
Yukon Gold	4⅜

LONDON Apr. 6

Name of Com.	Clg.
Dolores	£1 10s 0d
Stratton'sInd.	0 3 3
Camp Bird	1 8 6
Esperanza	2 16 3
Tomboy	0 18 9
El Oro	1 8 3
Oroville	0 9 6

BOSTON EXCH. Apr. 5

Name of Comp.	Clg.
Adventure	6½
Allouez	46
Am. Zinc	26
Arcadian	5⅛
Arizona Com	20
Atlantic	7½
Boston Con	17½
Butte & Balak	9½
Calumet & Ariz.	66
Calumet & Hecla.	580
Centennial	18¼
Con. Mercur	.10
Copper Range	71
Daly-West	9½
East Butte	8½
Franklin	15
Granby	45½
Greene-Can.	9⅜
Hancock	20
Helvetia	3½
Indiana	28½
Isle Royale	18
Keweenaw	4½
Lake	57½
La Salle	14⅜
Mass	7
Michigan	5½
Mohawk	52
Nevada	21½
North Butte	35⅛
North Lake	15½
Ojibway	8½
Old Dominion	38
Osceola	142
Parrot	16
Quincy	82½
Shannon	12
Superior	45⅛
Superior & Bost.	12⅜
Superior & Pitts.	13¼
Tamarack	55
Trinity	7
U. S. Smg. & Ref.	43
U.S.Sm. & Re., pd.	49½
Utah Apex	3½
Utah Con	26½
Victoria	3⅞
Winona	8
Wolverine	128
Wyandotte	2½

BOSTON CURB Apr. 5

Name of Comp.	Clg.
Ahmeek	‡190
Bingham Mines	‡3½
Boston Ely	3¾
Calaveras	5 1/16
Champion	.09
Chemung	10
Chief Cons	2
Chino	14¼
Cons. Ariz.	‡2⅝
Corbin	.08¾
Cactus	3¾
Crown Reserve	‡3⅞
First Nat. Cop.	2 1/16
Gila Copper	6⅞
Indiana	‡34½
Inspiration	7¾
Majestic	.86
Nevada-Douglas.	3
New Baltic	8
Oneco	4 1/16
Ray Central	3 1/16
Ray Con	21½
Rawhide Coal.	.36
Rhode Island Coal	9
San Antonio	‡10¼
Shattuck-Ariz.	30
South Lake	9½
Superior & Globe.	.60
Trethewey	‡1¾
Tuolumne Copper	‡3¼
Vulture	9½
Yuma	.99

‡Last quotation.